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Optimal farm plans and normative supply schedules for milk and competing products in notheastern Iowa

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OPTIMAL FARM PLANS AND NORMATIVE SUPPLY SCHEDULES FOR MILK AND COMPETING PRODUCTS IN NORTHEASTERN IOWA

by

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INTRODUCTION

The problem of agricultural surpluses has been characteristic of American agriculture, except in time of war, for the last several decades. This continuing abundance has brought about governmental programs and private action to use or eliminate the excess production and bolster sagging farm incomes. Program efforts have consisted of attempts to increase demands, curtail supplies and have also included various attempts to support incomes by direct and indirect price subsidies.

Some farmers have sought to improve their incomes through organizing resources for greater efficiency. Changes made by individual farmers have tended to increase output per farm. Other farmers have sought more remunerative employment outside of agriculture. Consequently, the farm labor force in agriculture has declined greatly. Approximately 20 percent of the nation's labor force was in agriculture during the 1930's. By 1947, farm labor had declined to 13.5 percent of the U. S. labor force. In 1960, only 7.8 percent of the labor force was in agriculture (65, p. 205). The farm population has also decreased in absolute terms. Farmers' incomes remain low even with this increasing efficiency on farms, reduction of the agricultural labor force, and the governmental programs.

The organization of individual farms and governmental programs tend to be based on historical and traditional arrangements. This is due to lack of knowledge of efficient resource organizations, uncertainty and inertia. Farm organizational adjustments take place slowly compared to the need for such adjustments, and governmental programs often perpetuate inefficient production unless the old customs and institutions are altered.

This study is designed to give better guides for adjustments in resource organizations to farmers in the northeastern, or dairy area, of Iowa. The study also should be useful in developing sound governmental agricultural policies relating to this area. Determination of optimum farm organization is dependent on the production possibilities for alternative crop and livestock products for the available resources. Optimum farm organization is also dependent on the production possibilities and cost structures of other types of farms and in other regions, because of their combined effect on product supplies and prices. Governmental programs which would promote efficient use of resources must also take account of these economic relationships.

In this study, the competitive relationships among feasible agricultural products in northeastern Iowa are investigated. This, and similar studies in other nearby states (Minnesota, Wisconsin, Illinois and Michigan) provide the basis for assessing the regional competitive position for various products. In addition, other studies now underway in the northeastern United States will provide the basis for an analysis of the competitive position of the Lake States area (including portions of Iowa and Illinois) with the eastern seaboard, especially in regard to milk production.

Objectives

The general objectives of this study are to determine the optimum organizations of representative farms under alternative prices for milk and hogs and to determine the supplies of products forthcoming for these profit-maximizing farm organizations. Specifically the objectives are:

1. To determine characteristics of present farm organizations of farms in Northeast Iowa.

2. To derive profit-maximizing farm organizations by using linear programming techniques on representative farm types of Northeast Iowa for alternative hog and milk prices.

3. To derive normative supply functions and cross-supply functions which are aggregated to represent all of Northeast Iowa.

4. To provide data for regional aggregation and comparison of supply schedules for the Lake States to analyze the comparative advantage of states, areas and types of farms in producing milk, hogs, beef, corn and other products.

5. To investigate the feasibility of individual farm planning in regional adjustment problems.

6. To determine some of the characteristics which facilitate and impede farm adjustments in Northeastern Iowa and to investigate the nature and rate of present adjustments.

ANALYTICAL FRAMEWORK FOR THE DAIRY ADJUSTMENT STUDY

The farm commodity with which the Lake States dairy adjustment study (of which this study is a part) is mainly concerned, is milk. Therefore, in this chapter the general supply-demand situation for milk is briefly discussed as background for the study. Then, some aspects of the theoretical framework upon which this study is based are presented. Following that, the use of linear programming in deriving aggregate supply functions is discussed.

The Dairy Problem

Developments occurring in markets for agricultural products and the changing structure of production costs on farms are forcing changes in the organization of farms. Present and potential farmers need to be able to accurately evaluate the adjustment alternatives they face. Dairy farmers currently receive relatively low returns for their labor and management because of low prices for dairy products at the farm level and low productivity of resources on dairy farms.

For dairy farmers, particularly, the change in the form in which dairy products are used is an important consideration. The decline in demand for milk-fat is forcing many dairy farmers, particularly those not equipped to sell grade A milk, to re-evaluate their farm organizations. In addition, a surplus of milk production (at a price farmers consider to be satisfactory) has been prevalent since 1953. Since 1953, the U. S. Department of Agriculture has spent an average of approximately $320 million dollars per year for dairy price support programs. The prospects are for costs in the fiscal year of 1961-62 to be the highest ever at $532 million dollars (73, p. 21). Purchases by the U. S. Department of Agriculture have amounted to about 5 percent of production since 1953 (73, p. 31). Thus, some substantial readjustments, either in price or in production are needed to bring production more nearly into balance with consumption.

In spite of a very substantial decline in number of dairy cows in the United States the production of milk continues to increase as shown in figure 1. Even though there has been a 30 percent decrease in cow numbers since World War II, milk production has increased by about 7 percent. This increase in total production has resulted from the great increase in production per cow because of substantial improvement in the inherent ability of cows and better care and feeding.

Population expansion would have absorbed the slight overall increase in milk production, except that per capita consumption has fallen. Per capita consumption of milk used in fluid items reached a high in 1945 at 335 pounds. After the World War II, fluid milk use declined to around 300 pounds per year. Since 1956, per capita use has been falling by an average of about 5 pounds per year. By 1960, civilian per capita consumption of fluid milk was 287 pounds. Cream consumption has fallen even more rapidly. There has been a steady decrease in per capita consumption from 13.6 pounds in 1946 to 9.3 pounds in 1960 (71, p. 5). The decline in demand for these products partly reflects consumer reaction to real or imagined benefits from reducing intake of certain fats contained in milk. It also represents decreased consumption on farms where fewer farmers are

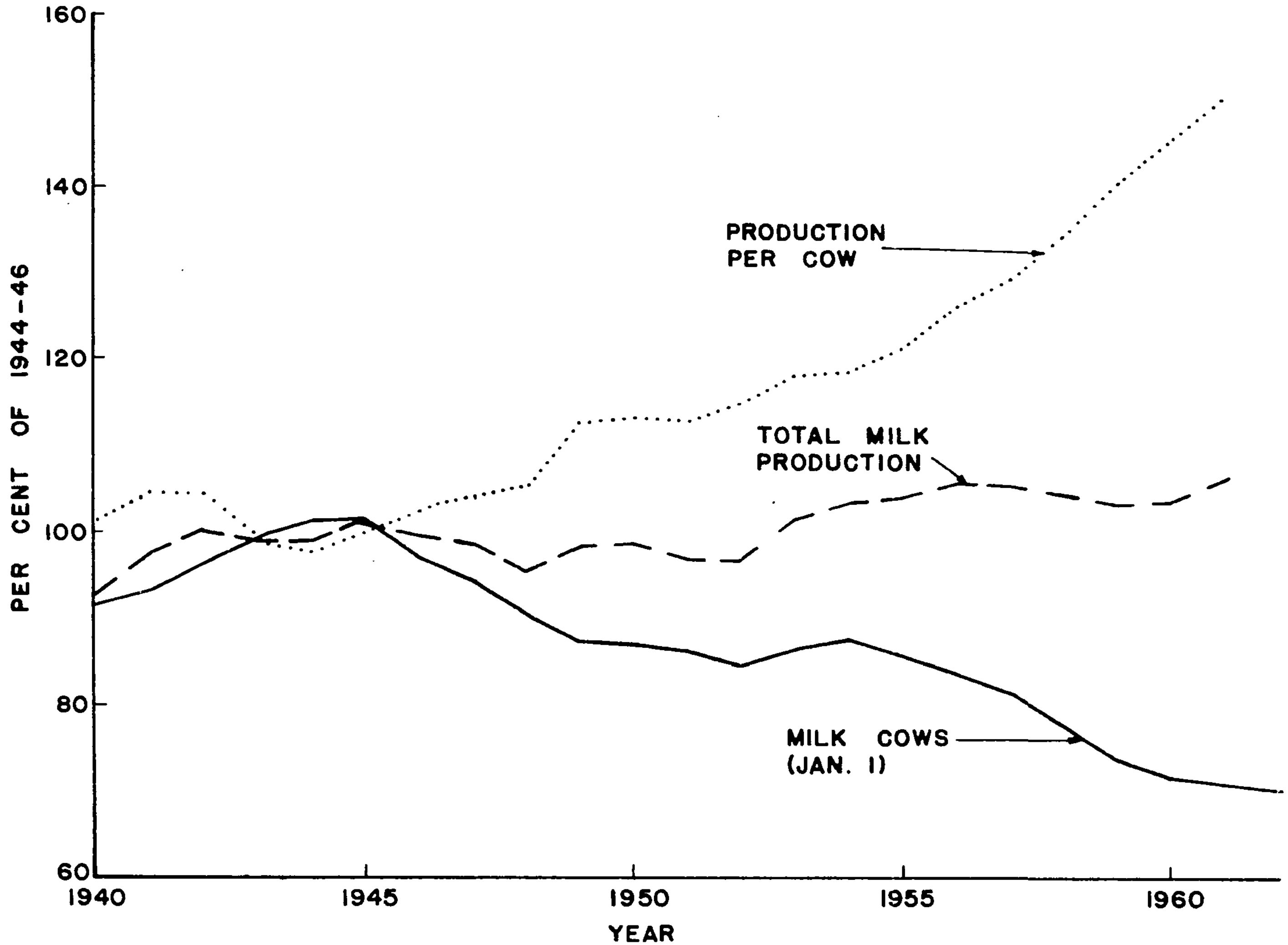

Figure 1. Number of cows, production per cow and total milk production by years for the U. S. as a percent of 1944-46. Sources: (73, p. 12 and 74, p. 5)

keeping milk cows. Farm families with milk cows consume more dairy products than families in the rest of the population. When these families give up dairying, their rate of milk consumption drops substantially. One estimate is that this decline in on-farm consumption is amounting to one-fourth of the total decline in milk consumption (71, p. 9). Differing rates of population growth in different regions of the country, development of new products, and changing consumption patterns of consumers are causing changes in demands for agricultural products. But, on the supply side too, important developments are occurring.

The reduction in cow numbers has not come about through a reduction in herd size on all dairy farms. Along with the decline in cow numbers has come widespread adoption of cost-reducing but output-increasing technology. There are now substantially fewer, but larger, more specialized dairy farms. Data from 26 states where data are available indicate that between 1954 and 1959 the number of farms reporting fewer than 20 cows declined. The number of farms with large herds increased. About half as many farms in the 26 states reported from 2 to 9 cows in 1959 as were reported in 1954. The number of herds of 30 or more cows increased by about 34 percent in the period 1954-59 (72, pp. 10-11). These figures show that many adjustments are currently taking place in dairy farming. The data for Iowa indicate similar adjustments.

The technological advances on the farm as well as in the marketing channels are having effects on the market structure for milk. Highway and truck improvements have made long hauls feasible. Farm bulk-handling methods have facilitated bulk assembly and processing. The adoption of the new farm technology such as milking parlors, pipeline milkers and bulk tanks has resulted in an increase in the size of dairy operations to take advantage of scale economies. These new buildings and facilities have also been designed to meet fluid milk market specifications. Increasing amounts of manufactured dairy products such as butter are being made from surplus milk which is eligible for fluid consumption.

The increased transportation possibilities have had the effect of bringing widely separated producing areas for milk, as well as for other products, into competition with one another. Milksheds for fluid milk are no longer insulated by space to the extent that they were formerly. The possible widespread use of sterile concentrate milk will tend to bring even more distant producing areas into competition for markets. The ultimate effect of these developments seems to be that we are rapidly moving to having nearly all commercial milk production qualified for fluid use and that we will have a national milk procurement area with prices in the different regions interrelated by transportation costs. Separate milksheds are not likely to continue their isolated existence.

In the Lake States, the new technology has not been adopted as rapidly as in some areas. This is especially true in the western part of the Lake States and in northeastern Iowa. Interregional studies like the dairy adjustment study for the Lake States provide a basis for planning in anticipation of changes in each area. These studies take into account needed changes within a given producing area and in other areas contributing to the same and related markets. If we know more about the supply functions and relative changes and forces operating within and among regions we can be in much better position to advise on occupational and investment decisions and to aid in government policy formulations which promote efficiency.

Policy Implications

Obviously, no individual farmer can assume that he alone will adjust to changes which are taking place throughout the dairy industry. In order to account for possible changes in all types of farms, representative farm models have been constructed for use in the Lake States dairy study. Optimum plans for these representative farms have been developed for comparing their competitive position. In the Lake States study, and through other similar ones, including one which is now underway in the northeastern United States, regional implications of these optimal adjustments are being studied.

Many of the farmers in the Lake States have already or may be expected in the future to make what appear to be satisfactory adjustments to price and resource conditions. They are either dropping dairying as well as other enterprises, or increasing their capacity to produce. The net aggregative effect for milk, and for many other agricultural products, has been increased output for the industry. Thus, these apparently satisfactory adjustments necessitate another round of adjustments. Many adjustment studies never consider the aggregate effects of individual firm actions. In a case like dairying where new techniques and organization are involved, the aggregative effect is a most important part of the adjustment process. In this study, by considering optimal adjustments for a region and aggregating the effects of these adjustments (supply of products forthcoming), the plan is to account for the aggregative effects of these optimal adjustments by individual firms and relate these aggregate quantities back to the individual farms from which the products should come.

This study is forward-looking, rather than descriptive of past trends and actions, in that the prices and production coefficients are projections for 1965. The optimum plans for each type of farm include modern technological advances in dairying if it is profitable to do so. New technologies and farm organizations are considered in this study in terms of how they are related to, and how they may be attained from the present varied structures of human and other resources which presently exist on farms.

From the point of view of policy-making, most useful supply information must be in the form of regional or national aggregates. But, as Heady (18) points out, we need to study relationships and decision processes which underly individual output choices since supply rests on micro relationships in agriculture. More of the individual firm relationships and decision processes can be accounted for in individual farm planning than in an aggregated supply analysis. But, unless the firm and industry are related in an analysis of adjustment, the conclusions of research workers can be of little value to policy makers, or even very helpful to individual farmers with their adjustment problems.

There is a close relationship between interregional competition and agricultural price and production policy. If certain prices are supported at too high a level, desirable adjustments between products and between regions will be retarded. A study of optimum response to adjustment stimuli for some time in the future provides a basis for guiding farmers in adjusting and also guidance for policy-makers to obtain the greatest benefit from resources presently engaged in agriculture.

Analysis of adjustment possibilities either in regions or for individual firms in producing a certain product can be based on the principle of comparative advantage. The concept of comparative advantage evolved in several stages. The first stage was developed by Adam Smith in 1776 as the simple principle of specialization. Areas were able to gain by specialization due to differences in natural resources which brought about concentration on one or a few commodities. Ricardo and Mill developed an explanation for regional specialization that was the first to be called the principle of comparative advantage. Their principle states that: Each area tends to produce those products for which its ratio of advantage is greatest compared with other areas, or its disadvantage least. This formulation suggests comparing advantages between alternatives within an area and between areas. More recent concepts deal with production possibility curves and marginal rates of product substition for alternative products in an area and for the same product in different areas and the choice criterion of the price ratios.[1]

[1]See Heady, (17, pp. 639-671) and French and Kehrberg (14) for example.

Area supply and demand functions are closely related and can be used for the same purposes. A market equilibrium can be established from the price and quantity given by intersection of supply and demand schedules. The aggregate demand and supply schedules are the horizontal summation of individual firm supply schedules or consumer demand schedules. Since we are dealing with agricultural commodities in this study, each producer and consumer would be forced to accept the market price.

It is evident that whether the change which causes need for adjustments stems from changes on the production, or on the consumption side, both supply and demand schedules are necessary to analyze the effect on volume and prices. However, a study of supply alone, especially when mainly changes in production costs are in prospect, will indicate the relative magnitudes of shifts in production needed in the different producing regions or areas. Demand studies are needed to estimate the magnitude of such shifts. A comprehensive study of interregional production and consumption of even one commodity is so broad that it needs to be approached in a piecemeal fashion. It was thought to be most useful to begin with a study of the supply situation, or a portion of the supply situation.

Supply Functions from Cross-Sectional Data

Many possible methods are relevant for studying supply relationships. The method selected should depend on the uses to be made of the study. The method of aggregated firm responses based on cross-sectional data was selected for use in the Lake States study because of the interest in interregional competition and in relating the aggregated supply estimates back to adjustment needs within regions. Allocation back to individual firms or representative firms is a simple matter if the aggregate supply estimates have been built up by a summation of the individual schedules. Any one farm is sure to have some special features as to types of land within it, buildings, composition of the farm family, and the like which call for some adaptation of over-all area adjustments. These adaptations can best be made on the basis of planning for several representative farms from which the adaptations to each individual farm can be made.

Main points of the method of deriving aggregated firm responses based on cross-sectional data are discussed by Mighell and Black (36). They report studies where budgeting estimates were given for optimum response to price changes. The method involves estimating of supply functions for a set of representative farms and aggregating the results based on relative occurrence of the selected farm situations in the population.

The distinction of "normative" supply estimates is usually given to the optimum responses derived from budgetary or linear programming studies from a cross-section of producers. "Conditional normative" is a more correct description because of the many institutional and internal resource restrictions imposed on the profit-maximizing goal.

Normative supply curves for both milk and hogs are derived in this study. They are not smooth curves in the neo-classical fashion. Nor, are they reversible. Actually, the supply curves represent only the production quantities at which farm organizations would be optimized at the given prices for one single adjustment in moving from the present organizations. If the organization of the farms change, the nature of the supply curves may also change. No possibility of moving up or down the particular supply curve is assumed, once the optimum adjustments have been made.

Horizontal summation of individual supply curves to obtain aggregate functions facilitates the allocation of aggregate effects of adjustment back to individual farm types. If a sufficient portion of the supply affecting a market area could be estimated, then, together with a projection of demand for the commodity, an equilibrium adjustment could be computed. However, the market area for dairy products is almost, if not, national in scope. Therefore, analysis of normative adjustments for all sources and potential sources of supply of milk would have to be accomplished. Such a state of knowledge is not in the immediate outlook. Thus, we may simply look at alternative prices on the aggregate supply curves to see the quantity of milk that "should be" produced and also estimate the price at which present production "should be" continued. The various price assumptions applied to the individual representative farm schedules would also reveal the optimal quantities of milk and the farm plans, therefore adjustments that "should be" made for each of the farm types.

Aggregate Supply Curves from Linear Programming

The main innovation which has come about since Mighell and Black's writings (36) has been the refinement and use of linear programming techniques for estimating firm supply curves. The adaptation of variable pricing modifications of linear programming provides a convenient method for deriving optimum farm plans in response to product price changes.

There have been several articles describing research which used the same general methodology as used in this study. One of the earliest studies where firm supply functions were derived using linear programming was made by Easley (13). He derived optimum supply functions for milk for a particular farm under various resource restrictions and for several types of dairy enterprises. The stepped functions derived by Easley are reported in Ladd and Easley (33), with smoothed curves and supply elasticities. Other studies which have used similar techniques are Krenz et al. (31), Heady et al. (19) and Toussaint (57). Plaxico (38), McKee and Loftsgard (35) and Krenz et al. (32) discuss and show examples of optimum firm supply schedules and the aggregation of these firm supply schedules. Barker and Heady (5) in a somewhat different type of study, derived cost curves for various types of milking facilities.

In the programming for this study, enterprises which were feasible over the next few years were used. Beef-fattening, beef cows, as well as cropping activities were alternatives to the hog and dairy enterprises. These alternative activities represent opportunity costs to production of milk or hogs in the programming solutions.

The procedures of linear programming have been treated in many articles. The use of linear programming to derive supply curves, however, will be discussed briefly.

Cochrane (10) has distinguished between supply functions and response functions. The supply relations derived in this study are of the type which Cochrane describes as "supply" functions. Optimum quantities of production are specified where price of only the one product in question is varied. All other prices, resource restrictions and production coefficients are held constant.

The procedure used in this study is to vary prices of one product over the relevant range of interest to determine the price ranges over which a particular combination of enterprises is optimum. This provides a normative supply curve, indicating the amounts of products which should be produced at each price level, if profits are maximized. The procedure is then repeated, holding a price or resource at another level and varying one of the prices. Thus, a group of ceteris paribus supply curves are produced. The supply function so derived is of a stepped nature because of the linear nature of the production data, and the limited number of production alternatives and resource restrictions. Thus, supply curves derived by linear programming differ from classical, smooth supply curves. The stepped supply functions have horizontal ranges, extending until a particular resource restriction is encountered. They then have a vertical segment which defines the price range over which there is no change in the plan. The assumption of profit-maximization used in programming optimum farm plans restricts the nature of the supply function to a normative schedule, or what "should exist" if producers made decisions aimed at maximizing net income based on perfect knowledge.

In this study the programming matrix was formulated as described by Heady and Candler (20, pp. 265-307) to obtain linear programming solutions for varied prices. For variable pricing of milk, all dairy activities contribute milk production to a special milk row rather than crediting each alternative dairy cow activity with the proceeds from milk sales. A separate activity is used to sell milk. The price on this single activity is then varied, with this activity "using up" the milk contributed into the milk row by the dairy activities. Solution of a program begins at prices below which any milk production is profitable, then proceeding to higher prices. In the solution of a program, when a new plan is obtained prior to any milk production the $Z_j - C_j$ value of the milk selling activity is observed. If the $Z_j - C_j$ is greater than zero, the price on the dairy selling activity is increased until the $Z_j - C_j$ is equal to zero. If the $Z_j - C_j$ on milk selling or any other activity is less than zero, an optimum plan has not yet been obtained. When the $Z_j - C_j$ on milk selling is zero, this activity may be introduced without any change in $Z_j - C_j$'s of other activities or change in profit. When the $Z_j - C_j$ of the milk selling activity is a positive value, there is an opportunity cost to selling milk. The increase in milk selling price is to remove the opportunity cost. The next problem is to find the minimum price change to make another plan optimum.

The milk selling price for the new plan is equal to the price in the previous plan plus the minimum price change necessary to drive one of the $Z_j - C_j$'s to zero. The procedure is thus repeated until all plans have been derived over the range of prices of interest. The stepped supply functions show quantities that "should be" produced in different price ranges given the normative assumptions.

Although traditional supply concepts assume a continuous supply function where producers respond to a very small change in price, these changes, in response to very small price changes are not observed in either industry or agriculture. In fact, it appears that just as in the linear programming solution there is a range of prices over which producers make no change in the production plans. Aggregation of a number of stepped supply functions smoothes out the steps, since the border (corner) prices are at different levels and the horizontal segments are made relatively shorter by adding in other stepped supply functions and changing the scale of the quantity axis.

One of the limitations of using linear programming in the study of an enterprise like dairying is the difficulty of handling the "scale" problem. There is evidence that for labor and capital, input-output coefficients do not remain constant as the scale of operation increases. Linear programming is quite adequate in handling those situations where decreasing returns to scale exist. Figure 2 is an illustration of this case. The linear programming problem can be set up to approximate the production relationship $Y = f(x)$ by a series of linear segments. The segments OA, AB, and BC each become separate activities and are restricted to the level of inputs X_1, X_2 and X_3, respectively. The activity represented by OA comes in first, next AB and finally BC in accordance with their rate of output with respect to the scarce resource. Average production coefficients which are often used if the level of production is expected to coincide with the input level X_3, are represented by the line OC.

In the cases where increasing returns to certain resources exist, a

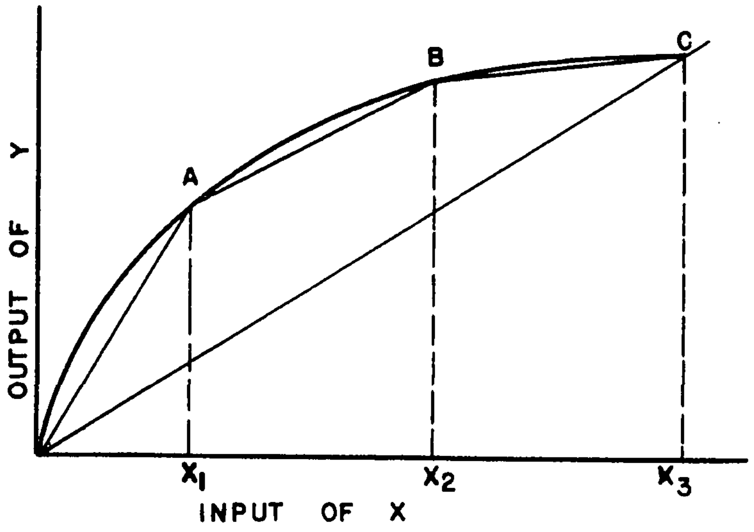

Figure 2. Decreasing returns to variable input

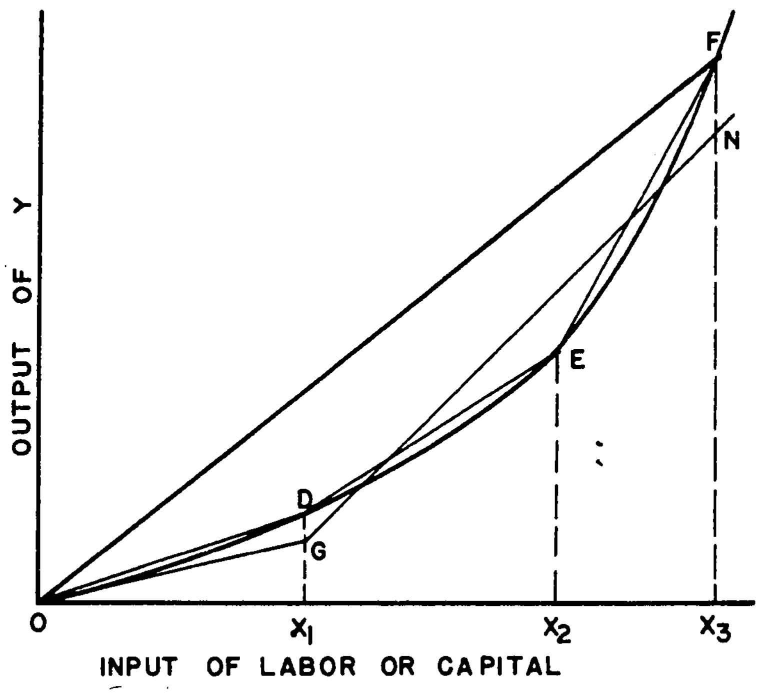

Figure 3. Increasing returns to labor or capital

satisfactory linear programming solution is not so readily obtained. In this case the most productive activities also come in first in the ordinary programming solution. But, the most productive activities, represented by the segment EF in figure 3, are not valid without being preceded by the activities represented by the segments OD and DE.

In this study it was found that labor requirements per dairy cow decrease as cow numbers increase because of certain set-up time requirements for equipment and for cleaning and other fixed or semi-fixed labor uses. These labor requirements are not perfectly divisible. Capital inputs also tend to be indivisible since the milking parlor and pipeline milking equipment come as a unit. Therefore, two programming solutions were compared: (1) A plan which holds input of labor and capital used in dairy activities to zero, and (2) a solution which requires use of activities represented by the segment OG, and chooses among activities represented by the segment GN in figure 3. The segment GN represents activities for which labor and capital requirements are only marginal requirements. In this study, all fixed labor times and capital costs which were not perfectly divisible over all the ranges of inputs are charged against the first five cows. Then, only none or any number more than five cows, are allowable in program solutions. Thus, the complete use of the segment OG in figure 3 (which represents the first five cows in this study) is required in order to be on the segment GN. Program solutions were compared, i.e., net revenue associated with the optimum plan with no cows was compared with net revenue from plans with more than 5 cows. Since milk was being variable priced, cow numbers, as well as net revenue were increasing as each iteration of the program solution proceeded. The exact milk price and number of cows at which it became more profitable to have more than five cows than to have no cows was computed. This method of handling increasing returns was only used in connection with the dairy enterprise, since it is an expensive device to use in computing. Also, compared to other types of enterprises, there is more evidence of increasing returns to the variable factors in dairying.

REPRESENTATIVE FARM SITUATIONS FOR NORTHEASTERN IOWA

Northeastern Iowa was selected for the area of this study because of its contiguity with the states of Minnesota, Wisconsin and Illinois. These states are also participating in the Lake States Dairy Adjustment Study. In addition, northeastern Iowa has more dairy farms than do other parts of Iowa.

In order to study present farm characteristics and derive optimum farm plans for representative farm situations in northeastern Iowa, a sampling procedure was devised. The following section describes procedures used in conducting the farm survey. Following that, some area and farm characteristics are presented.

Sample of Farms

In selecting representative farm situations for the 17 county area of northeastern Iowa, the region was first divided into two major soil areas as shown in figure 4. These major soil areas, divided on county lines, are based on the principal soil association areas as shown in Shrader et al. (41, p. 9) and Stritzel (55, p. 2). Area I is generally the Carrington-Clyde area (more recently called the Kenyon soil area) and Area II is generally the Fayette soil area. This delineation of major soil areas was used to make production areas as homogeneous as possible. A sample of farms was taken from each of these two areas separately. The sample was drawn on the area segment basis using the Master Sample of Agriculture. One hundred farms in each major soil area were set as an approximate goal in order to have an adequate sampling rate. Using the

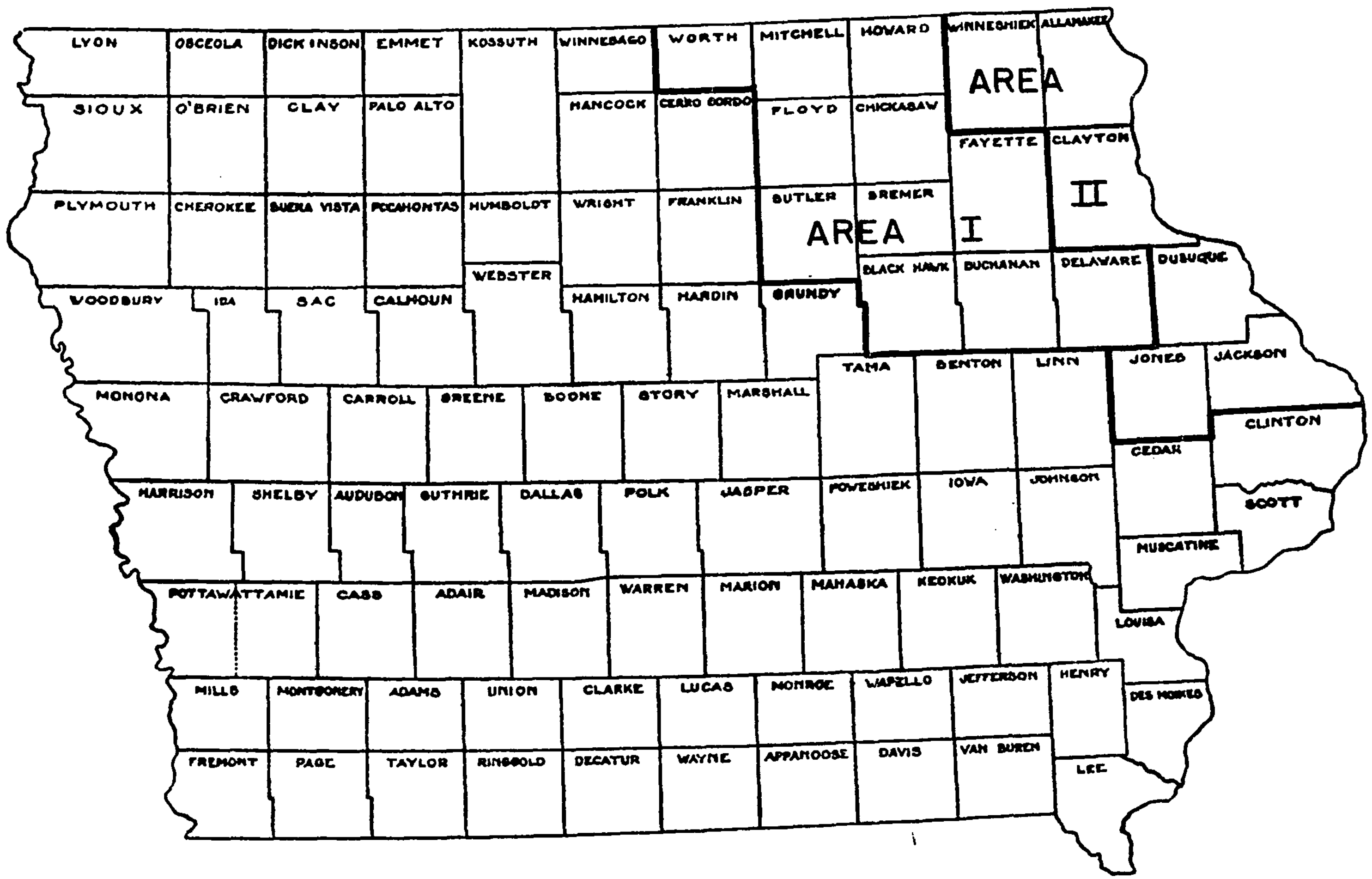

Figure 4. Major soil area county groups for northeastern Iowa

1954 Census of Agriculture (69), the average number of farms per area sampling segment was obtained. From this, the number of segments necessary to obtain the expected sample of 100 farms was determined. A secondary sample of segments, one-half as large as the primary sample, was drawn. This secondary sample was to be used in case of need for replacements to compensate for refusals and the decline in farm numbers which has occurred since the 1954 census.

A two stage sampling procedure was used to reduce travel costs in enumerating. Townships were first identified. Then, a sample of townships was drawn at random from each major soil area. Sample segments were then drawn at random with the condition that two primary segments and one secondary segment would be drawn in each of the townships selected.

In making the farm survey in June, 1959, attempts were made to contact each of the farmers whose farmstead was located in a primary sampling segment. Secondary sampling segments were used as needed to get the approximate number of desired farm schedules. It happened by chance that 103 usable farm schedules were obtained from each area, making a total of 206 schedules for both areas.

The data obtained in the farm survey includes information on: location of the farm, tenure of the operator, farm size, crop production, sales and expenditures, fertilizer use, machinery and buildings and equipment available, livestock enterprise descriptions, recent farm changes, family composition and labor available for farming, expectations for future disposition of the farm, expected future occupations of operator and family, previous experience of farm operator, nature of and income from off-farm work and the capital position of the farmers.

Construction of Representative Farms

The data obtained in the sample survey provided information for constructing representative farm situations. These few representative farms were used to represent the principal types of farming situations in northeastern Iowa. Either of two methods could have been used in forming representative farms. First, several actual farms from the farm survey could have been selected as representative of farms in the area. Second, composite farms of a few sizes and types, having mean and modal characteristics of the random sample of all farms could be constructed. The second alternative was selected as being the best.

From the information obtained in the sample survey of farms all the farms in the sample were post-stratified into ten groups of farms. The stratification was conducted as shown in figure 5. Numbers in parentheses are the number of sampled farms in each category.

Throughout this report, as in figure 5, "grade A" will be used to describe milk eligible for fluid use. The "grade B" milk is manufacturing grade.

The data from farms which fell into each of the strata were used to construct the hypothetical representative farm for each stratum. The resource limitations used in programming optimum farm plans were largely determined by averaging characteristics of the sample farms in each strata. Relevant production alternatives were also determined to some extent by

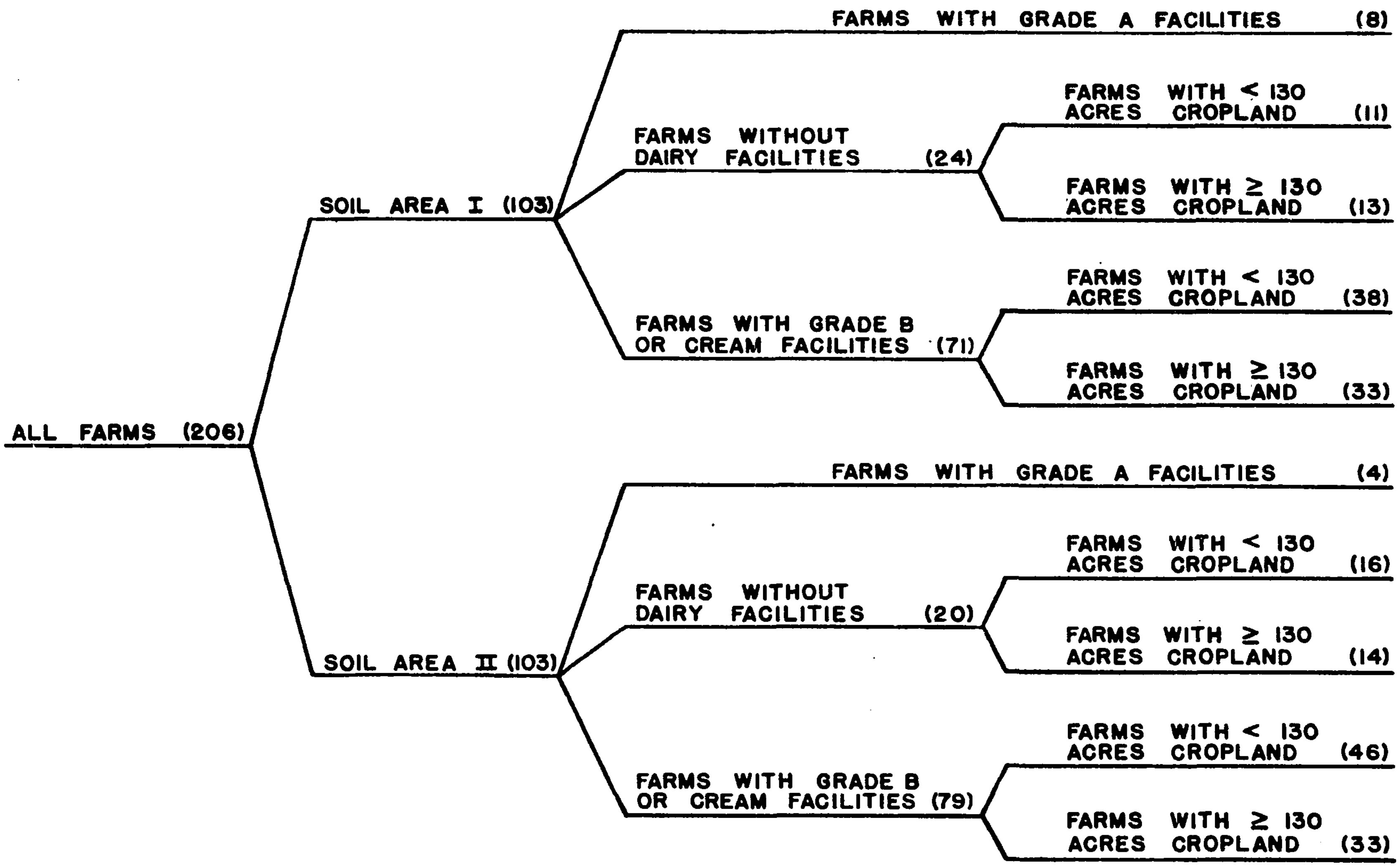

Figure 5. Stratification scheme for placing sampled farms into representative farm categories

availability of markets and facilities. Dairy markets for grade A milk, for instance, are available only in stratum 1 in each area. Therefore, production and sale of grade A milk is limited to these two strata. Only 12 farms of the 206 in the sample survey have facilities and market for grade A milk, but 150 of the 194 remaining sample farms have facilities for producing grade B milk or cream. Stratification also revealed that 101 of 194 non-grade A farms have less than 130 acres cropland. Most of the grade A producers have fairly large farms in relation to average.

Table 1 shows some of the resources available and other characteristics of the representative farms constructed for each strata.

The sample appears to be effective in representing all farms in the 17 counties. One check on the representativeness of the sample was made by comparing the sample estimate of cropland per farm with the average obtained from the 1959 Census of Agriculture (70). In each major soil area the divergence between the sample estimate and the average reported in the census is less than one percent. These sample estimates are considered to be very close to the actual acreage, especially considering the low sampling rate of one-half percent in one area and slightly less than one percent in the other. This comparison provides some indication that the sample is reliable.

The ten representative farms are of varied types and sizes. The composite farm organizations which these synthesized farms represent reveal that many of the farms are highly productive, substantial operations. But, a substantial group of farms are shown to have command of only a small group of resources and one low in production. Among all farms in the

Table 1. Characteristics of representative farms determined by stratification from data taken in farm survey

ITEM	UNIT	Area I Farm 1	Area I Farm 2	Area I Farm 3	Area I Farm 4	Area I Farm 5	Area II Farm 1	Area II Farm 2	Area II Farm 3	Area II Farm 4	Area II Farm 5	Average per farm
Number of farms from sample	no. farms	8	11	13	38	33	4	6	14	46	33	-
Average cropland acreage	acres	272	76	235	97	197	173	72	190	90	215	152
<u>1958 land use</u>												
Corn	acres	112	24	110	42	84	52	35	100	28	79	62
Oats	acres	42	6	55	27	38	34	13	34	22	48	32
Hay & rotation pasture	acres	112	13	50	24	49	87	24	55	37	72	46
Soybeans	acres	6	15	14	4	20	0	0	1	2	10	8
Other uses	acres	0	18	6	0	6	0	0	0	1	6	4
Milk market	-	A	None	None	B or cream	B or cream	A	None	None	B or cream	B or cream	-
No. of milk cows (1958)	head	35	0	0	11	13	31	0	0	14	18	12
Facilities for dairy	head	40	0	0	18	19	41	0	0	16	21	15
Litters of hogs (1958)	litters	24	10	26	16	24	17	12	34	16	33	22
Feeder cattle (1958-59 feed. yr.)	head	26	7	35	0	9	0	24	77	0	8	12
Beef cows (1958)	head	8	3	10	2	2	1	3	12	3	8	5
Hay sold (1958)	tons	1	0	28	12	5	0	1	0	0	2	5
Hay bought (1958)	tons	4	0	1	0	1	0	0	0	1	2	1
Corn sold (1958)	bu.	909	561	1300	483	890	800	217	393	77	289	478
Corn bought (1958)	bu.	2712	167	54	82	445	0	21	1429	212	300	397

sample, the total acreage per farm averages 199 acres. Cropland averages 152 acres per farm. For area I, the Carrington-Clyde soil area, permanent pasture acreage averages 19 acres per farm and in area II, the Fayette area, permanent pasture averages 64 acres per farm. These acreages of available forage cause a need for forage-consuming livestock to use the production which would otherwise go wasted. In addition, particularly in the Fayette area, some rotation forage is used to meet conservation goals. From the farm survey it was found that approximately 41 percent of the cropland was in corn, 21 percent in oats, 30 percent in rotation hay and pasture and 8 percent in other uses. Most of the 8 percent was in soybeans or the acreage reserve which was in effect in 1958.

Livestock enterprises vary from none at all to substantial numbers of one or more types of livestock. Dairy cows and beef cows are geared to the level of forage production on the farms with very little trading of hay taking place. Hogs and/or feeder cattle are kept on most farms in accordance with grain availability except for some few, primarily cash-grain farms, from which grain is sold and some few farms having large beef-feeding enterprises on which grain is purchased. Frequency distributions for the four main types of livestock are given in tables 2, 3 and 4.

As expected, the grade A milk producers tend to have the larger cow herds. Excess capacity in facilities for producing grade B milk or cream exists on many farms. Twenty-one farms that have dairy facilities now have no cows, or only one cow for home consumption uses. Most other producers have more space available than is being used. Still, over half of

Table 2. Number of farms by number of beef cows and dairy cows reported in sample survey

Number of head	Beef cows	Dairy cows
	No. of farms	No. of farms
0-1	165	62
2-4	3	9
5-9	5	22
10-14	4	21
15-19	10	44
20-24	7	20
25-29	1	15
30-34	2	4
35-39	3	6
40-44	2	2
45-49	1	1
50-59	1	0
60-69	2	0
Total	206	206

Table 3. Number of farms by number of litters of hogs reported in the sample survey

Number of litters	Hog litters
	Number of farms
0	38
1-10	27
11-20	45
21-30	48
31-40	25
41-50	10
51-60	8
61-70	2
71-80	1
81-90	1
More than 90	1
Total	206

Table 4. Number of farms by number of feeder cattle reported in the sample survey

Number of head	Feeder cattle
	Number of farms
0	172
1-20	8
21-40	4
41-60	8
61-80	3
81-100	2
101-120	1
121-140	1
141-160	2
161-180	2
181-200	2
201-220	1
Total	206

all farms sampled reported having cows on the place. In many cases, sheds or barns recently have been diverted from dairy to other uses, particularly beef-housing. In those cases where any alterations had taken place, facilities formerly used for dairy were not considered to be dairy facilities.

There is substantial hog production in northeastern Iowa. The farms in the sample averaged 22 litters of pigs per farm in the year prior to the survey. The number of hog litters per farm ranged from none to 166. The farm farrowing 166 litters was the only case of a fairly large-scale multiple farrowing enterprise. There were other hog producers who had as high as 85 litters of hogs with several arrangements of spring and spring-fall litters or two groups of spring or spring-fall litters which approached a multiple farrowing system.

Feeder cattle enterprises were found on 34 farms. The number of cattle fed on these 34 farms ranged from 2 to 210 head with both calf and yearling feeding systems represented. Ten of the feeders had substantial operations of more than 100 head of feeder cattle. In some cases, calves were purchased to use available forage supplies rather than maintaining dairy or beef-cow herds.

Beef-cow herds were kept on 41 of the 206 sampled farms. Slightly less than half of these had cow herds of more than 20 head. A somewhat higher proportion of the farms without dairy facilities had beef cows than was the case on farms with dairy facilities.

Dairying and hog production are both quite intensive, even relative to the rest of Iowa and the corn belt. Kolmer (30), shows that many of the counties in Iowa which rank highest in hog production are in northeastern Iowa. Beef-feeding is also an important enterprise.

THE PROGRAMMING MODEL

Various production alternatives make up the bulk of the activities in the linear programming model. Crop and livestock enterprises used are those familiar to the area since no really new type enterprises would likely be readily adopted by many farmers and, because of the extreme difficulty in determining input-output data for enterprises in a new environment. Some transfer and transaction activities are included to provide for realistic business operations for the farms. The production processes with their technical coefficients, product and factor prices and the resource restrictions are described in this chapter.

Crop Enterprises

Cropping sequence alternatives for the two areas are the same. However, recommended rates of fertilizer associated with the cropping sequences in the two soil areas are different. Also, different limits of cropping intensity are used to account for the differing erosion hazards. Crop activities are formulated as a sequence of crops to take account of the complimentary effects of growing crops in a particular time sequence. Two sets of crop rotation activities which differ only in rate of fertilizer use and in spraying for weed and pest control and the resulting yields are included in the model for each area.

Cropping alternatives are specified to permit the possibility of a cropping system ranging from a high concentration of forage at one extreme to corn at the other. Only three cropping sequences were used; continuous corn, corn-corn-oats-meadow, and corn-oats-meadow-meadow.

Considerable flexibility is possible with various combinations of these three. The three crops in these three rotations make up the bulk of the crops presently being used.

There are separate activities for the growing and the harvesting of corn or hay. Two alternative methods are provided for harvesting corn. It may be harvested either as grain or as silage to provide for additional flexibility in meeting grain and roughage needs in livestock production. The two alternative methods are handled in the programming matrix by separating the corn growing and corn harvesting activities. The resource requirements for harvesting are not charged against the crop growing activities, but only against the appropriate harvesting activity. The output upon being harvested becomes either corn equivalent which may be either sold or fed, or silage as roughage equivalent which may only be fed. The oats crop raised in some rotations is always harvested as grain. A bushel of oats is equivalent to one-half bushel of corn and contributes directly to the corn equivalents row where the oats may be either fed or sold. A hay harvesting activity is used so that unharvested forage grown can be either harvested or grazed. The harvesting activity transfers (at cost of harvesting and storing) the forage from the standing forage equation to the roughage equivalent equation. Only the need for hay in livestock production will bring in this activity.

Input-output data for crop activities are found in Appendix A and Appendix B. The production and fertilizer data are based on composite soils for each area as will be explained in the section on the land restriction and as shown in Appendix A. The input-output data are based on management levels superior to that found on the average of farms in northeast Iowa. The data reflect a level of management considered to be attainable on the "average" farm by 1965, the target date for this study. Thus, the study is forward-looking in that it estimates optimum production adjustments that should be made in terms of productivity of resources in the future. No prediction is made that farms in the area <u>will</u> reach the productivity levels specified in the programming data. It is only assumed that the average farmer making optimum farm adjustments could attain the efficiency and production levels used. The data which reflect efficient use of resources are a continuation of the normative assumptions used in this study.

Livestock Enterprises

Dairy, hog and beef enterprises make up the livestock activities used in programming. Present chicken, turkey and sheep enterprises are assumed to be continued at the same level. Resources used in these minor enterprises were deducted from those available for the activities used in programming. The basic data used in developing programming coefficients for livestock activities are found in Appendix B.

Dairy

Dairy cow activities were constructed for both stanchion and parlor milking facilities at three alternative rates of grain feeding. In order to account for increasing returns to labor and capital, the dairy activities were further divided into two groups. The first included the first five cows to which fixed labor and capital costs were charged and the other group allowed additional cows at marginal rates of use of labor and capital. Separate models were applied in order to consider the possibilities of a farm: (1) dropping or continuing to have no dairying, (2) using stanchion milking facilities, or (3) building and using a parlor set up. Parlor and stanchion facilities were not both used in a single model to eliminate the possibility of a mixed system. But, it was made possible that the optimum programs could include all those alternatives with respect to dairying as milk price was increased. For instance, the results could specify no dairy production at low milk prices, use of stanchion dairy facilities at medium milk prices and parlor milking facilities at high milk prices. Of the three program solutions obtained at each level of milk price, the one providing the highest net revenue is regarded as optimum and specifying the type and extent of dairying, if any, which would maximize profits.

The three alternative rations for dairy cows are based on the ratio of concentrates fed to milk produced. The coefficients are based on cows of good quality. It is assumed that the cows weigh approximately 1,200 pounds and that they are capable of producing 10,000 pounds of 3.5 percent fat corrected milk per year when fed 2500 pounds of corn equivalent (1:4 grain to milk ratio) and medium quality forage to the limit of stomach capacity. In addition to the 1:4 grain-milk ratio, other activities were specified for ratios of 1:2.5 and 1:6. Use of the 1:2.5 level of grain feeding increases milk production to 10,900 pounds and decreases roughage use. Decreasing grain to the 1:6 ratio reduces milk production to 9,210 pounds and increases roughage use. The use of three rations allows the best of the three to be used in the optimum plan according to the marginal rates of substitution and the price ratio between grain and forage. The cows are allowed to use pasture to fulfill the roughage requirement to the extent that the season for pasturing allows.

In addition to the cows own requirements, additional feed is included in the dairy cow activities to provide for replacement stock. The ratio of young stock for replacement to cows is 0.95:1.0.

The labor coefficients for dairying were developed mainly from Aune and Day (2). These data were obtained from actual field surveys of different size herds and for various kinds of equipment. It was from these data that the evidence for increasing returns to labor was obtained and the coefficients derived.

Capital charges in dairy cow activities are only for capital investment in cows and replacements since the frequent payments for milk offset current operating expenses. Separate activities were formulated for increasing the building restraint on dairying. Stanchion barn facilities could be built or increased at a capital cost of $529.31 per cow, with equipment and space for replacement stock included in this cost. The amortized cost of expanding stanchion facilities amounts to $52.73 per year. Since none of the representative farms had parlor facilities, use of a parlor and loose housing required heavy investment on any farm. Parlor facilities are assumed to be not completely divisible. Therefore, a complete parlor or none at all is required. The first five cows are charged the whole cost of the milking parlor. However, the loafing shed is assumed divisible in that it could be built in different sizes so that each cow is charged equally. Cost of bulk milk tanks is assumed to be partly fixed and partly variable. A fixed cost of $1,750. for the first five cows is used with $50. marginal cost for each additional cow. This capital cost is amortized to compute the annual expenditure. Total fixed capital charge for the parlor milking facilities including the bulk tank amounts to $9,103. Each cow requires $162. capital for loafing shed and variable cost portion of a milk tank. Other elements of costs and the resources used and products produced are shown in Appendix B.

Milk selling was not included in the dairy cow activities but was incorporated separately to facilitate the variable pricing of milk. Grade A eligible milk was priced at all prices up to $5.20 per cwt. and manufacturing grade milk up to $4.20 per cwt.

Hogs

Two alternative types of hog enterprises were considered in the analysis. These are a one-litter system of spring-farrowed hogs, and a two-litter system of a spring and a fall litter from each sow. Farrowing and feeding buildings and equipment are the same for one- or two-litter systems. Feed requirements, annual costs and returns and labor requirements for both systems are found in Appendix B. There is an activity which provides for expansion of farrowing and feeding space at a cost of $279.00 per litter. This amount, amortized over 15 years at 5½ percent interest, amounts to a yearly cost of $27.80.

Separate sets of the two hog-producing activities were made up for each of the six hog price levels used. Programs were solved (with milk variable priced) for each of these six sets of hog activities where market hog prices range from $11.10 to $18.60 per cwt.

High level of management is reflected in the hog enterprises by the weaning of eight pigs per litter and by efficient feed conversion rates.

Beef

There are five beef activities. Four are feeding enterprises, of which three use calves and one uses medium quality yearlings. All three calf-feeding enterprises are designed for 430 pound calves purchased in late October. All three groups of calves are wintered on fields and limited feed from November through mid-March. Calves fed on drylot are placed in the feedlot in mid-March and fed through October. Calves full-fed on pasture are put in the feed lot from mid-March to early May then taken out to pasture where full feeding is continued to late October. The calves full-fed after pasture, sometimes called deferred fed calves, are left on the wintering ration until early May, at which time they are placed on good pasture without supplemental feeding until early July. At this time they are brought to full-feeding while on pasture and fed on pasture until October. These calves are then full-fed on drylot until the end of November. The yearling steers are also purchased in October and given a limited wintering ration. The steers are then full-fed from early February through May when they are sold. The other beef activity is a beef-cow herd which produces calves for sale. This latter activity is included primarily in case the roughage is not usable in other enterprises. The inputs and outputs for the beef enterprises are contained in Appendix B.

Beef housing and feeding facilities are defined in terms of an animal unit (one beef cow). The beef cow enterprise requires one unit of housing, while each of the feeder cattle uses 0.571 units. There is also an activity which allows for expansion of shed and feeding and pen facilities at a cost of $91.15 per animal unit. The amortized (yearly) cost amounts to $9.12 when amortized over a period of 15 years at $5\frac{1}{2}$ percent interest.

Other Activities

Transaction activities for buying and selling corn were included to allow realistic flexibility in farming operations. The corn-buying and selling activities allow further ranges of farm plans from cash-grain to concentrated feeding operations. The buying price for corn is 5 cents higher than the selling price to account for handling costs.

A silo building activity was provided to increase the ability to use corn silage as a means of providing roughage. The silo cost is $20.16 per ton of storage capacity, or an amortized cost of $2.01 per ton. Use of corn silage permits more roughage-consuming livestock than would be possible with only legume and grass roughages.

Labor-buying activities are specified which would provide labor in any period of short labor supply. The cost of the labor is defined as the weighted average of farm wage rates being paid in northeastern Iowa and the wages being earned by farm operators in off-farm work. This procedure is used since the quantity of labor hiring is restricted to current hired labor use plus the amount of off-farm labor being performed by farm operators.

Short-term capital borrowing is included as a separate activity to add capital to the cash on hand. This borrowing activity is limited by the equity considerations explained in the section on resource restrictions. Short-term credit is charged a 7 percent interest rate. It is available for any of the current expense needs. Long-term credit borrowed against real estate equity is charged against each of the building activities. Savings is also included as a possible use of the cash on hand if farm enterprises would not provide more than the 4 percent return earned in savings.

Not all possible transactions or production alternatives are included as separate activities. Of the large number of enterprises which could have been included, only the most important and those likely to be most profitable were used. Many transactions such as buying supplement type feeds, repairs and other annual costs have been associated with the production processes to which they pertain. No account is made of fixed costs to the farm, since fixed costs do not influence the set of production alternatives used.

Prices Used in the Analysis

The prices used in setting up programming models in this study are projections for 1965. These price projections represent extensions of trends from 1953. Prices prior to 1953 were heavily affected by wars and depression for more than 20 years.

Non-farm produced input prices were projected as increasing from present price levels. However, buildings and fences and motor supplies are the only inputs which would have significant impact on results of the model. Extension of the 1953-59 trend yields an increase from 1959 levels of 12 percent for buildings and fences and 10 percent for motor supplies. Other input prices have been rising faster, e.g., motor vehicles and farm machinery, but these inputs are fixed and not limiting in the programming model. Other inputs such as equipment and supplies, fertilizer and lime and farm produced inputs have no clear-cut trends, so that 1959 prices are used. Prices used are found in Appendix C.

Projected prices were developed for the Lake States region. Differences between the states were based on the historical differences. This procedure accounts for transportation costs and the differences in demands and resource costs where any differences exist.

There is a possible problem in banning prices on historical data in this regional study. There is no assurance that the transportation patterns from the aggregated optimum plans as will be the same as those which presently exist. However, historical price differentials are used as a first approximation, and at least for the main products (pork and milk) under consideration, alternative intra-regional price differentials may be investigated if regional production and transportation patterns are materially changed. The regional coordination of prices is essential in comparing the programming results and supply functions from the different areas.

Resource Restrictions

The resource restrictions for programming were derived mainly from representative farm characteristics. Data from all of the farms which fell into each strata were averaged, or typical characteristics were selected where averaging was not possible. Detailed data on the restrictions used in programming are found in Appendix D.

Land

Average acreage of cropland for the farms in each stratum is used as the restriction on crop acres. All farms within each of the major soil areas have the same composite soil types based on weighted averages of the several soil types shown in Appendix A. Land was held fixed in programming because of difficulties in handling the aggregation of optimum plans if all or most farms should either increase or decrease farm size. A few farm plans (which were not aggregated) were computed where land purchase was allowed, to test the profitability of farm expansion. Some estimates of the relative value of additional land for each farm type are available from the marginal returns for resources which were obtained in programming. These marginal value products are found in Appendix E.

Labor

Average hours of operator and family labor available less the quantity used in overhead labor tasks (given in Appendix B) in each of the six periods of the year is used as the initial level of labor available on the farms. Labor-hiring activities add to the quantity of labor available.

Labor-hiring limit

The amount of labor which had been hired in the year preceding the survey plus the amount of off-farm work performed by the farm operator dictates the amount of labor-hiring allowable. Operators' off-farm work is included here to allow the possibility of farm enterprises being profitable enough to "buy back" the operators' time from non-farm employment.

Corn acreage limit

The percentage of cropland in each area which can be devoted to row crops (corn) and still attain conservation goals was converted to acres for each representative farm. In area I, this restriction allows 97 percent of cropland to be planted to corn, while in area II, 65 percent is allowed to be in corn. The difference is attributable to the greater slope and erodability of some soils in area II.

Corn acres grown

This restriction is not used as a limit on corn acreage, but relates the acreage of corn raised to the method of harvesting that acreage. Standing corn is used as an intermediate product of the rotation activities which is an input in the corn-harvesting activities.

Meadow grown

This equation is similar to the corn acres grown equation, but it applies to the raising of legume or grass roughage. Meadow grown, stated in terms of hay equivalents, is an intermediate product of the rotation activities and an input into the hay harvesting or livestock activities.

Corn equivalents

Feed grain crops other than corn (i.e. oats) are stated as outputs of the crop production activities expressed in terms of the amount of corn to give an equivalent feed value. Corn harvested as grain also appears in this equation. Corn purchasing also supplies corn equivalents. The corn equivalents of this equation are inputs in livestock feeding and corn selling activities.

Roughage equivalents

The roughage equivalents equation shows the product produced by the hay harvesting and corn silage harvesting activities. Purchase of hay is not allowed. Roughage equivalents are inputs in the livestock activities reflecting requirements for roughage in a harvested form.

Cash on hand

The initial level of the cash on hand restriction is the cash on hand at the beginning of the production period plus the value of livestock owned at that time. Activities use from this equation for annual production expenses. Production costs for crops and livestock, crop harvesting costs, feed grain purchase and labor hiring costs are items included. These costs are also deducted from gross income. The short-term capital borrowing activity transfers borrowing capacity from the short-term credit limit equation to the cash equation at a cost of 7 percent interest.

Short-term credit limit

This equation is for limiting the quantity of short-term capital which can be borrowed. The borrowing activity uses from this equation. The initial level of this restriction amounts to one-half the monetary value of the machinery inventory less indebtedness on machinery. Certain activities can increase the credit limit. Feeder cattle, for instance, increase the credit limit by the amount of their purchase price to reflect the policy of many lending agencies that allow 100 percent loans on feeder cattle purchases if feed is available. The capital used in purchase of feeder cattle as well as other capital used in cattle feeding is charged in the cash on hand equation. Thus, capital borrowed only where needed, and at the interest change of 7 percent. Other livestock enterprises also contribute to the capital borrowing base, but in each case the charge against cash on hand is more than the increase allowed in the credit limit.

Real estate credit limit

Building costs to enlarge the livestock enterprises are charged against real estate credit limit. This equation limits real estate debts to one-half the value of present real estate. The initial limit is one-half of the value of present real estate minus present real estate debts. Amortized costs of real estate investments are also deducted from gross income.

Dairy facilities

The initial level of this restriction is the number of cows that could be handled with existing stanchion facilities on the representative farm. This limitation can be increased by adding stanchion facilities or by building a complete loose-housing system. Any farm, whether it has any dairy facilities at present, or not, can add facilities for grade B milk production. Only the 12 farms which currently have grade A milk facilities and market can add to grade A production facilities.

Hog facilities

The hog facilities equation has a beginning level of the number of litters that can be farrowed and grown out. One- or two-litter systems use the same amount of space, since two litter systems reuse the same facilities for the second litter in a year. This restriction can also be increased by a hog facilities expansion activity.

Silo capacity

This restriction limits the corn silage which can be stored, but can also be increased by the silo building activity.

Beef capacity

Beef capacity is stated as the number of animal units that can be handled in present facilities, except all farms are assumed to have facilities for 10 beef cows or 18 head of feeders. Different types of beef enterprises use at different rates according to their animal unit rating. Beef facilities can also be expanded by making the necessary investment of capital funds.

PROGRAMMING RESULTS

Linear programming solutions were obtained for two purposes. Optimum farm resource organizations for alternative price assumptions are presented in this section for each of the representative farms. The farm management data are presented as price maps in this chapter and in tabular form in Appendix E to show farm plan changes as the prices of milk and hogs are varied. *Normative supply functions derived from the optimum farm plans follow the farm planning suggestions in this chapter.*

Farm Plans

Price maps for each of the ten representative farms provide a guide for farm reorganizations for a variety of farm situations and price expectations. The representative farms are not actual farms, but most farms in northeastern Iowa are sufficiently similar to some farm in the group that the guides to farm organization could be profitably used. Climatic and soils differences between the two areas are not so great that results from one area are inapplicable to the other. Area II does have more land suited only for permanent pasture and requires more erosion control practices. Productivity of cropland is not much different.

The price maps presented in this section do not show all farm plan changes that actually are specified in the program solutions. Major changes in farm plans are shown. Budgeting of some of the approximate plans which resulted from combining plans which were optimum in only a small price area showed that the income would only be reduced by up to one or two percent by following the approximate plan outlined in the price map rather than the true optimum plan.[1]

Price maps and farm plan summaries for each of the ten representative farms have some common characteristics. Figure 6 is a schematic representation of the way the principal types of enterprises are affected by price changes. The border lines for the enterprises vary because of characteristics of each farm, but most price maps have some similarity to figure 6. In every case, at low prices for both hogs and milk, the plans call for some beef-feeding. In a few cases, the organization is mainly a cash-grain farming operation. When milk prices are low, hogs generally become profitable at about $14.00 per cwt. At this price level they begin to be competitive with beef-feeding. Hog production increases as hog prices are increased with low milk price levels, until most available resources are devoted to hogs. When hog prices are low and milk prices increased, the dairy enterprise is enlarged to the exclusion of other livestock. If both milk and hog prices are high, both hog and dairy enterprises are usually fairly large. At medium prices for both milk and hogs, the optimum plan is sensitive to price changes. Shifts from beef-feeding to

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[1]Since hogs are only priced at 6 levels rather than at each price where the optimum plan changes, not all borders could be exactly defined as hog price was changed. Where hog activities enter the plan between two hog prices the border could be found by determining the rise from the lower price which is necessary to make the hog enterprise profitable. This price rise is computed from the $Z_j - C_j$ coefficients on the hog activities. No determination of the plan boundary is possible where no new hog activities become profitable between two prices. For instance, where a plan change included only changes in the number of litters of hogs produced, but utilizing the same activities, $Z_j - C_j$ values are zeros at both the higher and lower hog prices. Thus, there is no marginal loss for introduction of hog activities at either price level and no means for computing the price rise which would be necessary to eliminate the loss. Therefore some of the price borders are estimated between hog prices.

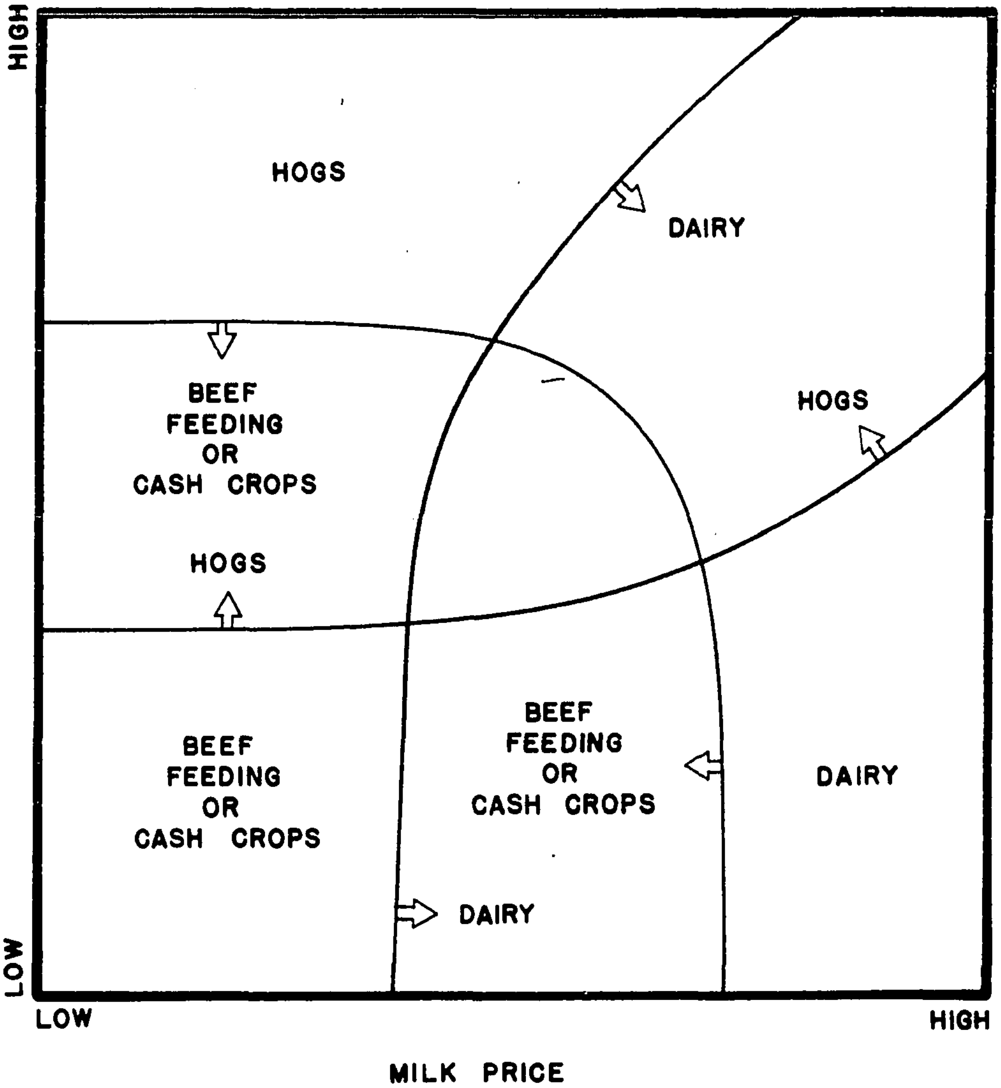


Figure 6. Schematic representation of the price maps obtained from variable pricing milk and hogs in linear programming for the 10 representative farms

dairy or to hogs or combinations of two or all three of these occur with small price changes. All crop sequences for every farm should be fertilized at the recommended rate as given in Appendix A. Not all of the plan changes are important income-wise or in terms of the magnitude of the enterprises. Furthermore, these price maps can only be useful as guides for any particular farm. These benchmark plans would need individual alterations according to budgeting computations to fit particular, actual farm situations.

The abbreviations and symbols used in the descriptions of the price maps and in later parts of this report are as follows: COMM = corn, oats, meadow, meadow; CCOM = corn, corn, oats, meadow; CCCC = continuous corn; SOWS (2 LITTER) = sows producing two litters of pigs per year; SOWS (1 LITTER) = sows producing one litter of hogs per year; COWS (STANCHION) = dairy cows using stanchion barn housing; COWS (PARLOR) = dairy cows milked in a double-4 herringbone parlor and sheltered in loose, or shed type, housing; MED. YRLGS. = medium grade yearling feeder steers; DEF. FED CALVES = choice feeder calves full-fed on pasture after wintering and grazing for 56 days on pasture in May and June; PASTURE CALVES = choice feeder calves full-fed on pasture after wintering; BEEF COWS = beef-breeding cows for raising feeder calves.

Price maps and farm plan summaries for each of the representative farms follow. More detailed plans for selected milk price - hog price combinations are tabulated in Appendix E. These detailed plans list the optimal set of enterprises, farm incomes, quantity of labor used, methods of handling feed and marginal returns to additional units of resources.

Farm 1 - Area I

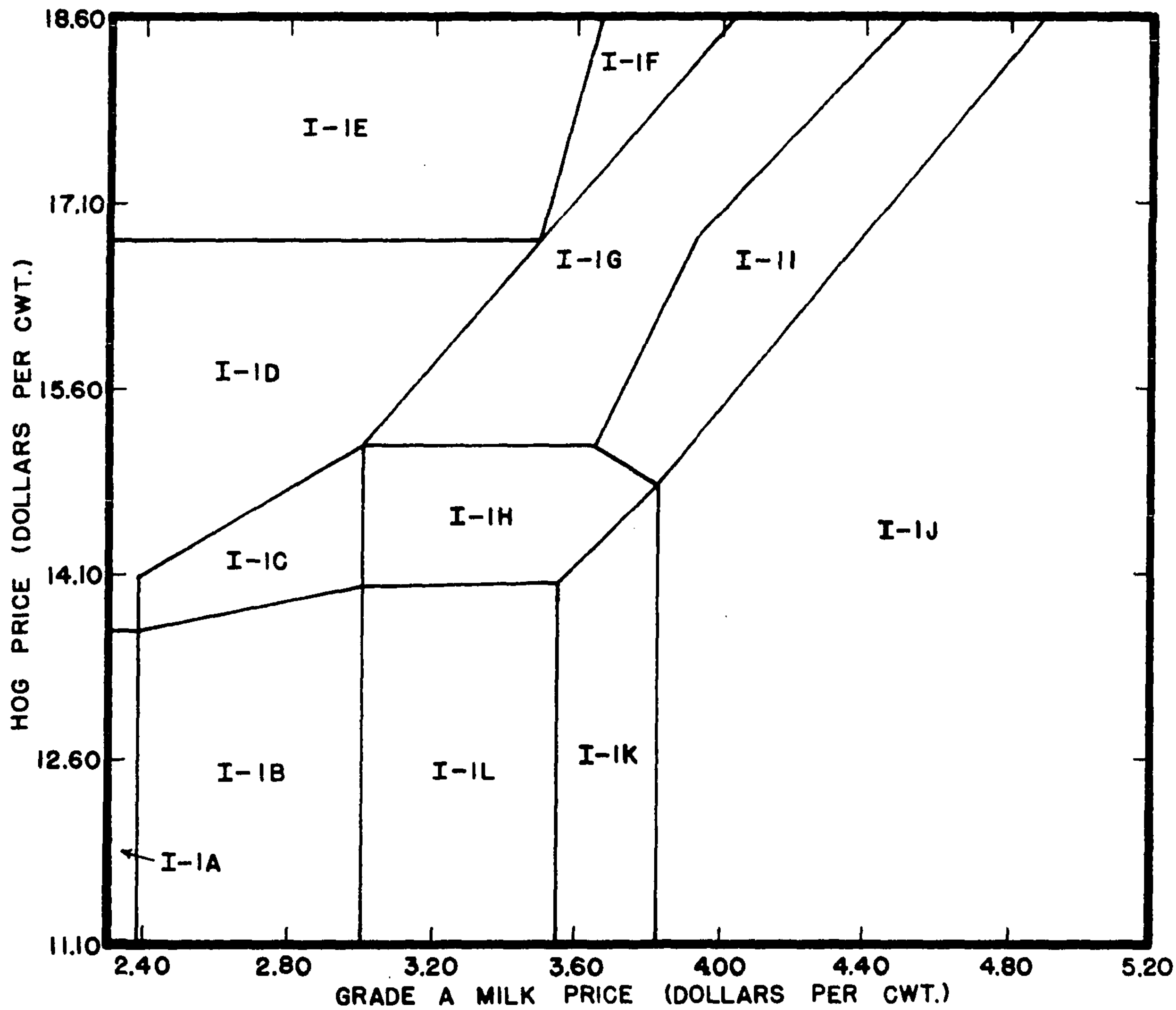
Dairying is a profitable enterprise over most of the relevant prices for milk and hogs in plans for this large (two man-years of labor and 272 crop acres) grade A dairy farm in the Carrington-Clyde soil area. The price map is figure 7. A shortage of operating capital relative to the size of the farm causes dairying to be profitable at lower milk prices (at low hog prices) than is the case for most of the farm plans. Plans for two other large farms which have facilities for producing manufacturing grade (grade B) milk also include dairying at relatively low milk prices because of a shortage of capital. Optimal plans for other farms, where operating capital availability is higher relative to size of farm, have beef-feeding enterprises and no dairying at low hog prices until milk price is raised to about $3.00 per cwt. Maximum use of present dairy facilities would be profitable for milk prices from $3.00 to $3.56 at low hog prices and for a higher range of milk prices where the opportunity costs are higher at higher hog prices. Optimal plans include an enlargement of stanchion-type milking facilities in a $0.25 to $0.30 range of milk prices above those prices at which present facilities should be at maximum use. At the right end of the price map, farm resources are devoted to a 78 cow dairy herd in parlor facilities.

Crop rotations are mostly continuous corn, and enough corn-oats-meadow-meadow to meet forage requirements. One year meadow rotations usually are not profitable because of the high fixed costs of establishing the meadow and the relatively low profitability of oats which is used more often as a nurse crop with one year meadow rotations. Optimum crop

Figure 7. Optimal plans for varied prices of milk and hogs for the grade A dairy farm (Farm I-1) in Soil Area I

Code	Enterprises
I-1A	94 acres comm 228 acres cccc 67 med. yrlgs.
I-1B	179 acres comm 93 acres cccc 23 cows (stanchion) 177 med. yrlgs.
I-1C	159 acres comm 113 acres cccc 11 sows (2 litters) 21 cows (stanchion) 143 med. yrlgs.
I-1D	21 acres comm 117 acres ccom 134 acres cccc 57 sows (2 litter) 38 med. yrlgs.
I-1E	21 acres comm 46 acres ccom 171 acres cccc 54 sows (2 litters) 23 sows (1 litter)
I-1F	216 acres comm 56 acres cccc 43 sows (2 litters) 30 cows (stanchion) 2274 bu. buy corn

Code	Enterprises
I-1G	226 acres comm 46 acres cccc 31 sows (2 litters) 40 cows (stanchion) 2382 bu. buy corn
I-1H	205 acres comm 67 acres cccc 8 sows (2 litters) 40 cows (stanchion) 67 med. yrlgs.
I-1I	246 acres comm 26 acres cccc 21 sows (2 litter) 52 cows (stanchion) 2750 bu. buy corn
I-1J	219 acres comm 53 acres cccc 78 cows (parlor) 2780 bu. buy corn
I-1K	240 acres comm 32 acres cccc 54 cows (stanchion) 67 med. yrlgs. 1672 bu. buy corn
I-1L	196 acres comm 76 acres cccc 40 cows (stanchion) 106 med. yrlgs.


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
2.40
2.80
3.20
3.60
4.00
4.40
4.80
5.20
GRADE A MILK PRICE (DOLLARS PER CWT.)
I-1A
I-1B
I-1C
I-1D
I-1E
I-1F
I-1G
I-1H
I-1I
I-1J
I-1K
I-1L

rotations are those with recommended fertilizer rates (see Appendix A) in every case on this farm as well as on all other farms.

Hogs are the only profitable livestock enterprise in the northeast corner of the price map. The hog enterprise goes up to 131 litters at high hog prices and low milk prices. In most areas of the map where hogs are in the optimum plans, they are produced in conjunction with beef-feeders or dairy cows, or both, depending upon price relationships.

The farm plan summaries on the map include corn purchases where necessary, but do not show corn sales where it is not required in feeding. It is assumed that all corn not fed is, of course, sold. Much of the corn acreage should be harvested as silage in order to meet roughage requirements where dairying is highly profitable.

Net farm income in this study is defined as gross income minus variable costs, interest on borrowed capital and a depreciation charge for new buildings and equipment.

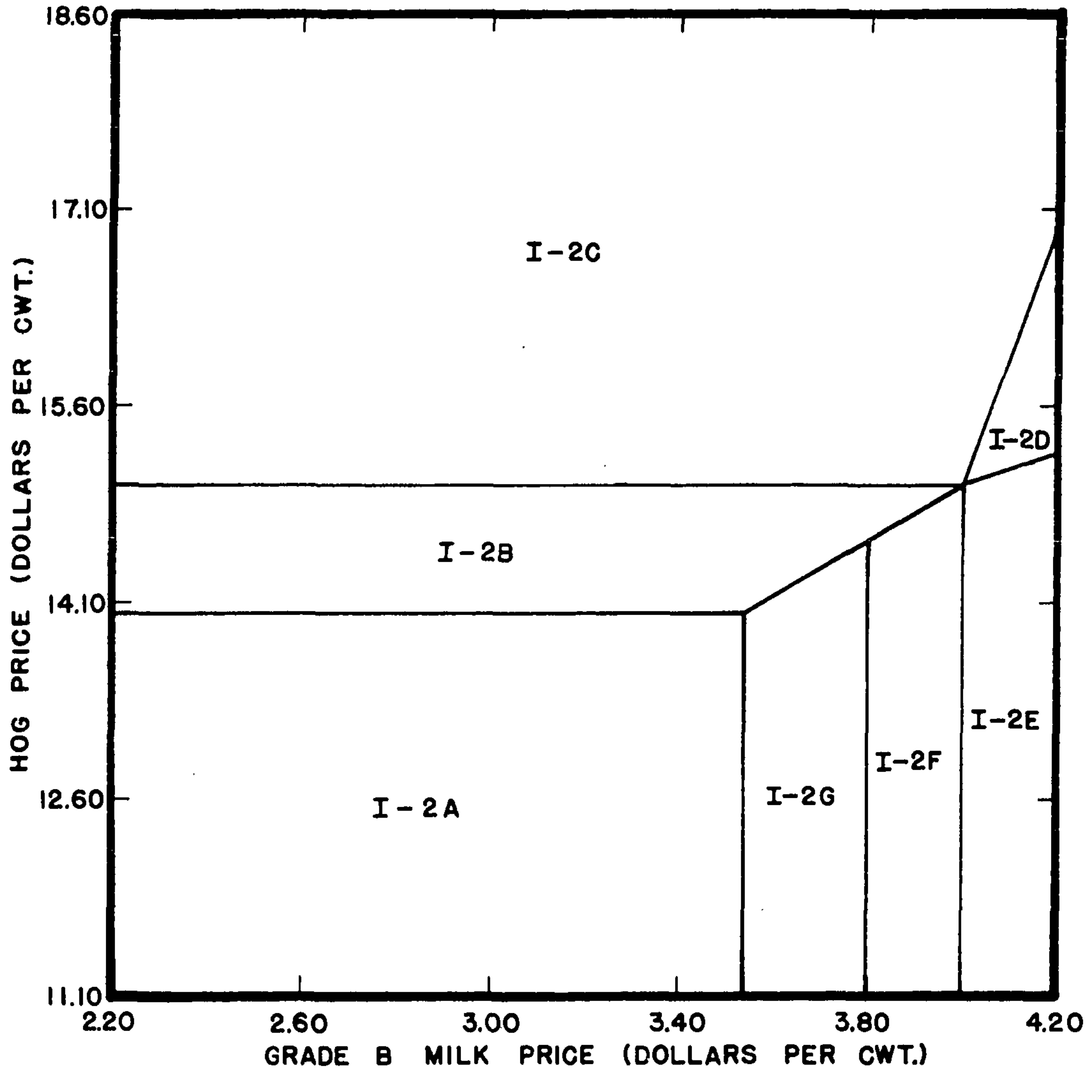
Net farm income varies from $14,451 to $31,716 in the program solutions for this farm. The amount depends on hog and milk prices.

Farm 2 - Area I

Dairying is relatively unprofitable at most prices in plans for this small farm without dairy facilities in the Carrington-Clyde soil area. When the milk price is raised to a high enough level to make dairying profitable, the resources of the farm restrict the dairying operation to a stanchion milking system of 21 cows or less. Labor on this group of farms is less than one man-year and there are 76 acres of cropland. Nearly half of the price map (figure 8) shows the largest possible hog

Figure 8. Optimal plans for varied prices of milk and hogs for the small non-dairy farm (Farm I-2) in Soil Area I

Codes	Enterprises
I-2A	2 acres comm
	74 acres cccc
	43 med. yrlgs.
I-2B	2 acres comm
	74 acres cccc
	7 sows (2 litters)
	63 med. yrlgs.
I-2C	24 acres comm
	52 acres cccc
	32 sows (2 litters)
	3200 bu. buy corn
I-2D	76 acres comm
	7 sows (2 litters)
	21 cows (stanchion)
	2403 bu. buy corn
I-2E	76 acres comm
	21 cows (stanchion)
	700 bu. buy corn
I-2F	73 acres comm
	3 acres cccc
	18 cows (stanchion)
I-2G	68 acres comm
	8 acres cccc
	14 cows (stanchion)
	18 med. yrlgs.


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)
I-2C
I-2D
I-2B
I-2E
I-2F
I-2G
I-2A

system as being most profitable. At any hog price above approximately $15.00 per cwt. most of the farm's resources are devoted to producing hogs. At medium hog prices and with the highest milk prices, most resources are in dairying along with a few hogs. A substantial cattle-feeding operation would be profitable at low hog prices.

Crops grown on this farm are used to support the livestock enterprises in all cases. Continuous corn and corn-oats-meadow-meadow cropping sequences are used to provide grain and forage. Permanent pasture also provides some forage from land not suited for cropping. A substantial amount of corn is harvested as silage (up to 206 tons) to provide roughage for feeder cattle and dairy cows. Corn purchasing in substantial amounts becomes necessary at prices where hogs are highly profitable.

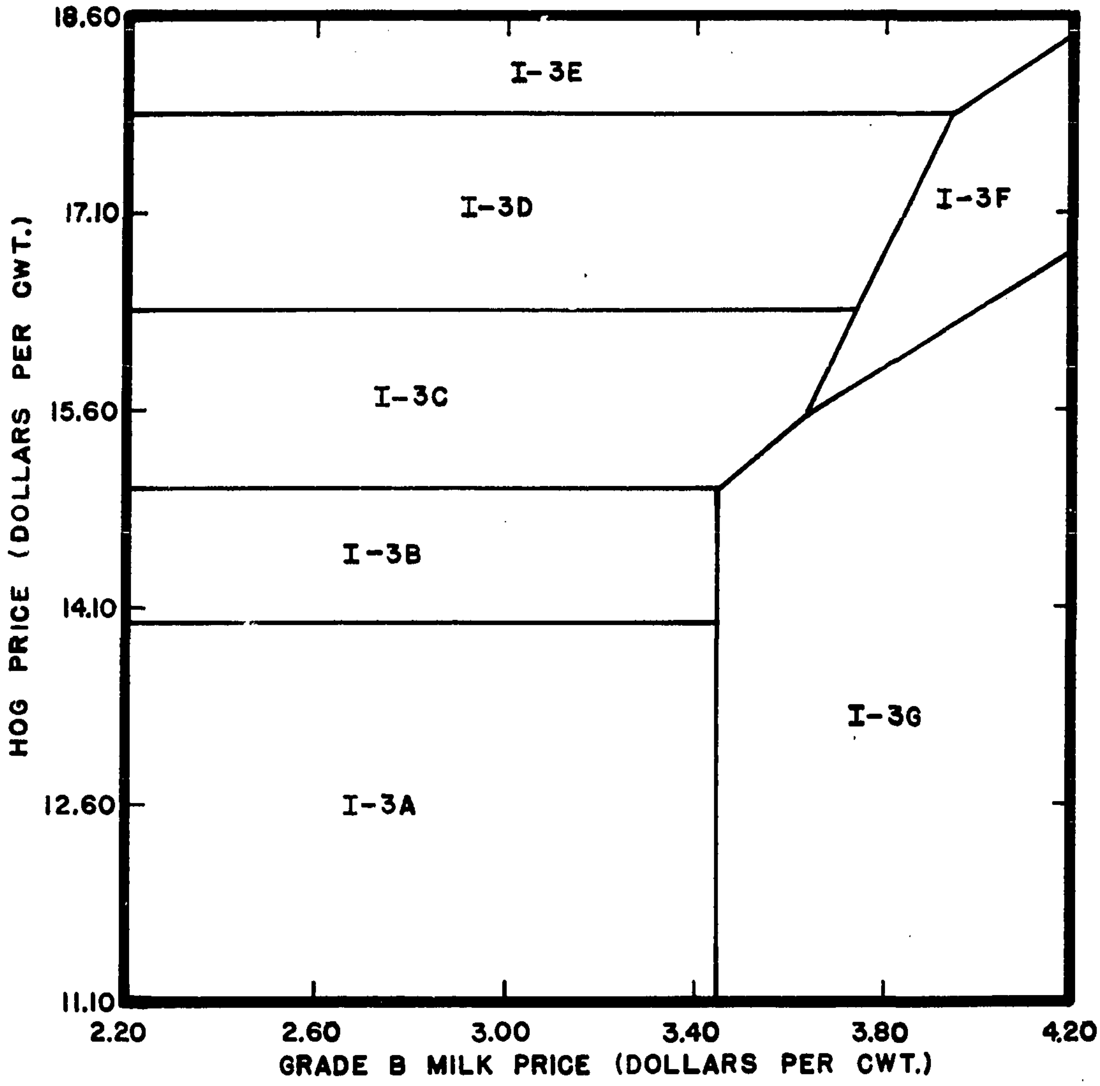
Shortages of capital and credit sharply limit this farm plan at hog prices above $17.00 per cwt. The marginal value product for capital ranges up to a 47 percent. Credit availability is not restricting at lower hog prices. Family labor in one or more periods of the year is limiting over most of the price combinations.

Farm 3 - Area I

The optimal plans for this large farm (about one and one-quarter man-years of labor and 235 acres of cropland) in the Carrington-Clyde soil area include feeder cattle in much of the price area (see figure 9). The group of farms which this farm represents has no dairy facilities but considerable operating capital. Dairying is profitable only when the price of milk is at least $3.45 per cwt., and then with loose housing and parlor milking facilities. In the lower ranges of hog prices at high milk prices,

Figure 9. Optimal plans for varied prices of milk and hogs for the large non-dairy farm (Farm I-3) in Soil Area I

Code	Enterprises
I-3A	114 acres comm
	121 acres cccc
	246 med. yrlg. feeders
I-3B	119 acres comm
	116 acres cccc
	4 sows (2 litters)
	227 med. yrlg. feeders
I-3C	107 acres comm
	128 acres cccc
	24 sows (2 litters)
	5 sows (1 litter)
	148 med. yrlgs.
	1023 bu. buy corn
I-3D	39 acres comm
	111 acres ccom
	85 acres cccc
	29 sows (2 litters)
	30 sows (1 litter)
	75 med. yrlg.
	1772 bu. buy corn
I-3E	57 acres comm
	178 acres ccom
	34 sows (2 litters)
	54 sows (1 litter)
	3 beef cows
	2515 bu. buy corn
I-3F	235 acres comm
	14 sows (2 litters)
	51 cows (parlor)
	2950 bu. buy corn
I-3G	235 acres comm
	63 cows (parlor)
	2020 bu. buy corn


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
I- 3E
I-3D
I-3F
I-3C
I-3B
I-3G
I-3A
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)

all farm resources are channeled into a dairy enterprise of 63 cows. Some hogs should be combined with dairy at high milk prices near the highest hog prices analyzed. Hogs as the only livestock enterprise are profitable only at hog prices above approximately $18.00 per cwt.

Crop sequences are mainly continuous corn and corn-oats-meadow-meadow, except in the price area in which hog production is heavy. There, the one year meadow sequence is profitable. Corn silage harvested ranges up to 413 tons for supplying the heavy forage requirements of the large dairy herd. Family labor availability restricts the plans for this farm rather sharply. MVP's for labor in one time period goes to $12.10 per hour for high prices for both milk and hogs. Other labor MVP's are lower, but of significance in deciding whether or not to hire extra labor. Net farm income ranges from $13,903 to $20,676.

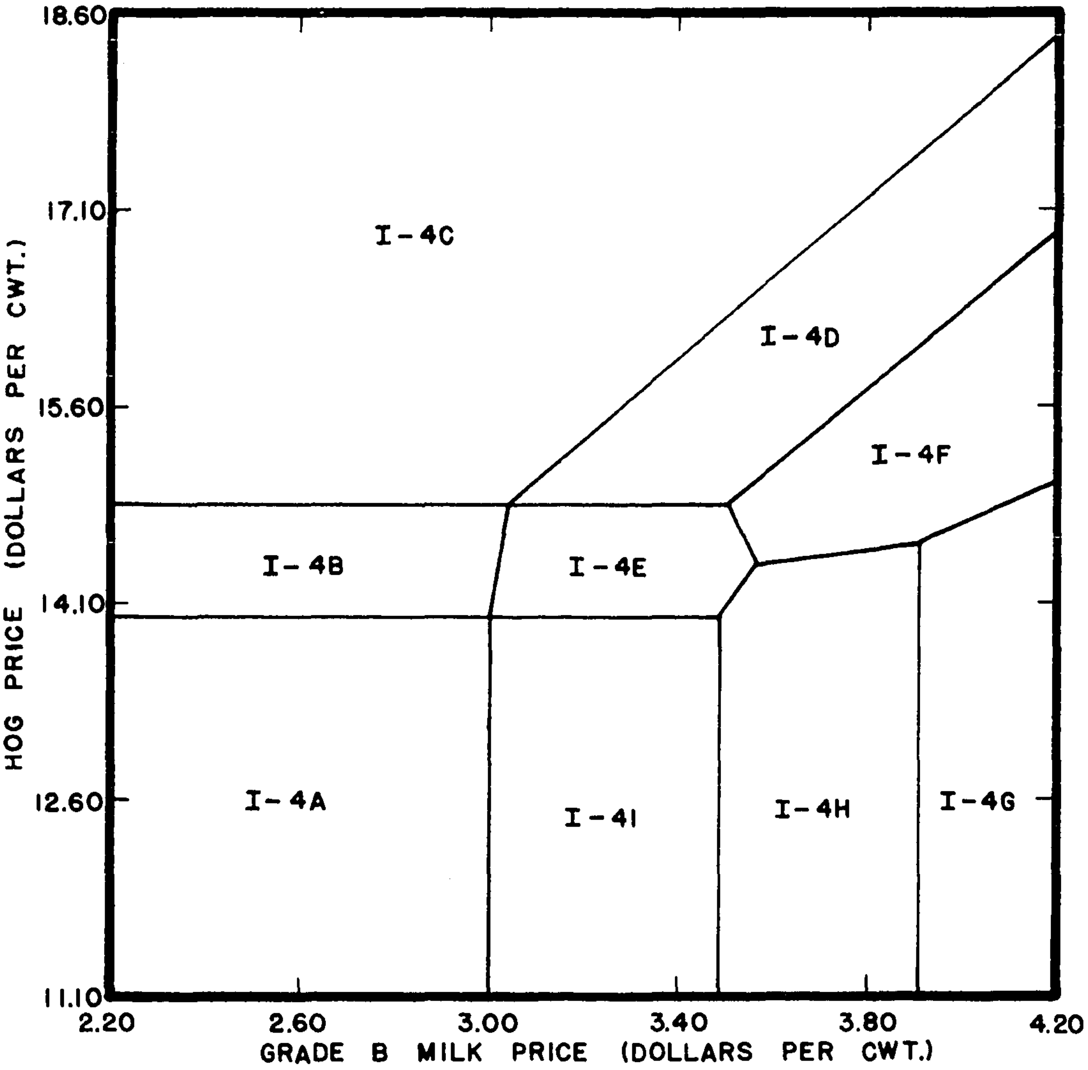
Farm 4 - Area I

Dairying, using stanchion facilities already on the farm, would be profitable over a substantial range of milk prices beginning at $3.01 per cwt. (at low hog prices) for the small dairy farm in the Carrington-Clyde area. The price map for this farm is figure 10. The 97 acres of cropland is programmed to be in either continuous corn or in corn-oats-meadow-meadow in all plans. Feed requirements are met by purchase of nearly 3,000 bushels of corn in situations where grain is limiting and by the harvesting of up to 400 tons of corn silage in addition to the hay in other cases where forage is in short supply.

Capital and other resource shortages restrict dairying to stanchion facilities. These facilities are, however, expanded to handle as many as

Figure 10. Optimal plans for varied prices of milk and hogs for the small dairy farm (Farm I-4) in Soil Area I

Code	Enterprises
I-4A	3 acres comm 94 acres cccc 119 med. yrlgs.
I-4B	3 acres comm 94 acres cccc 12 sows (2 litters) 66 med. yrlgs.
I-4C	24 acres comm 73 acres cccc 34 sows (2 litters) 2100 bu. buy corn
I-4D	54 acres comm 43 acres cccc 17 sows (2 litters) 18 cows (stanchion) 2466 bu. buy corn
I-4E	40 acres comm 57 acres cccc 4 sows (2 litters) 18 cows (stanchion) 18 med. yrlgs.
I-4F	71 acres comm 26 acres cccc 9 sows (2 litters) 9 cows (stanchion) 2817 bu. buy corn
I-4G	94 acres comm 3 acres cccc 34 cows (stanchion) 2383 bu. buy corn
I-4H	72 acres comm 25 acres cccc 1 cow (stanchion) 18 med. yrlgs. 2300 bu. buy corn
I-4I	36 acres comm 61 acres cccc 18 cows (stanchion) 39 med. yrlgs.


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
I-4C
I-4D
I-4F
I-4B
I-4E
I-4A
I-4I
I-4H
I-4G
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)

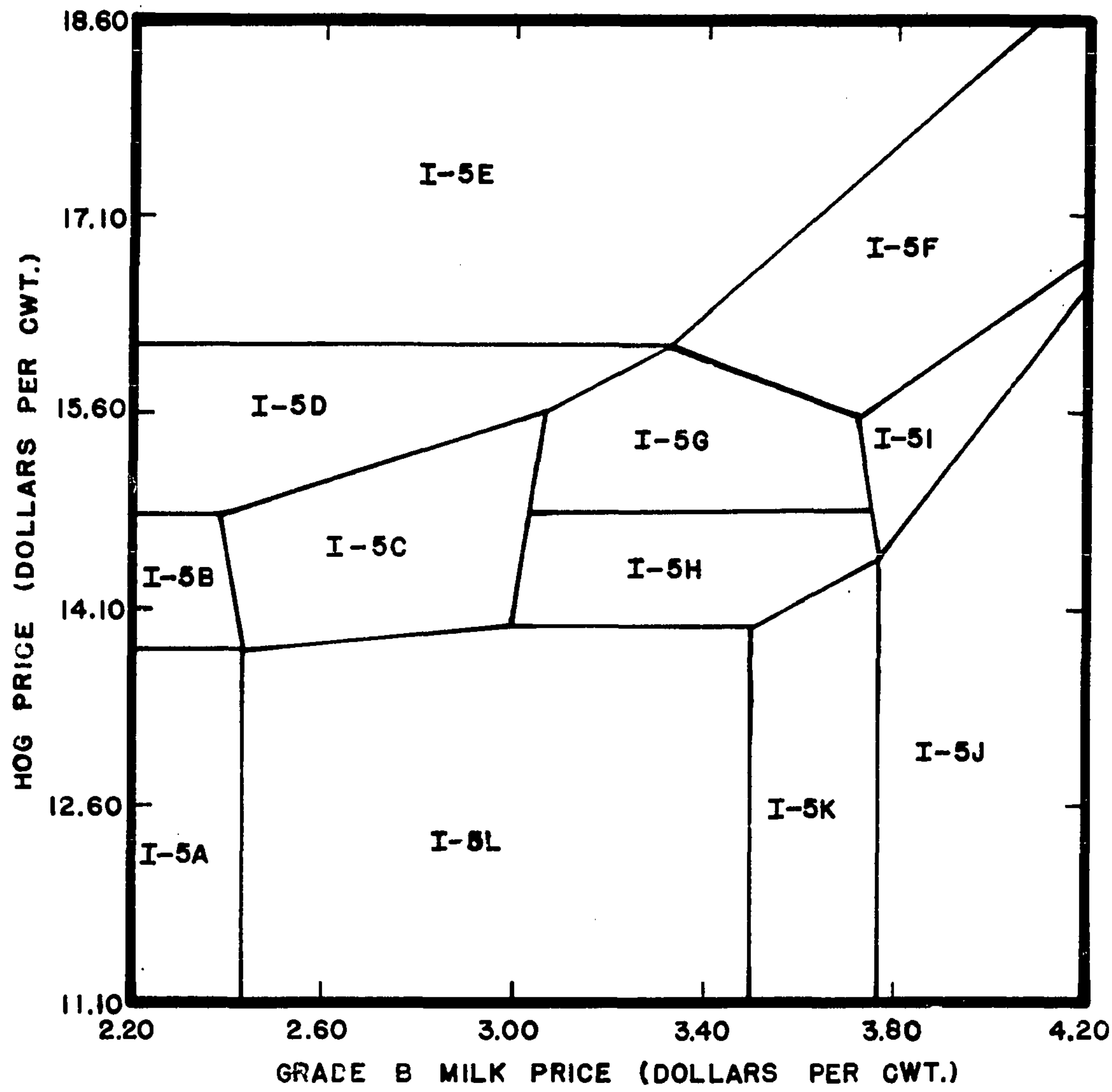
34 cows at high milk and low pork prices. Feeder cattle and hogs are more profitable than dairying at lower milk prices. In fact, the minimum milk price at which dairying is profitable is about $0.60 per cwt. higher on this small farm than is the case on the large dairy farm in the Carrington-Clyde area. The higher price necessary to warrant milk production in plans for the small dairy farm is caused by more plentiful capital in relation to other resources than is available on the large dairy farm. A substantial feeder cattle operation would be profitable for this small farm for low milk and hog prices. The beef-feeding enterprise represents higher opportunity costs, so that milk price must be higher to drive out beef-feeding and other enterprises other than dairying. Cash-grain farming uses up the limited capital in plans for low milk and hog prices for the large dairy farm. Other information such as farm incomes, MVP's and feed harvested is in Appendix E.

Farm 5 - Area I

A shortage of capital relative to the size of the farm causes a cash-grain farming operation to be most profitable for this large farm (197 crop acres and one and one-half man-years labor) at low milk and hog prices. Capital is sufficiently scarce that at these low prices the plan in figure 11 shows a fertilized, continuous corn cropping system and only a few feeder cattle rather than a large number of feeder cattle as on some other farms. Feeding cattle is not sufficiently profitable to warrant use of the limited capital for this purpose, even though the feeders are to a certain extent self-financing. A loan could be secured by the cattle themselves for the cost of the feeder cattle, but it would

Figure 11. Optimal plans for varied prices of milk and hogs for the large dairy farm (Farm I-5) in Soil Area I

Code	Enterprises
I-5A	5 acres comm 192 acres cccc 20 med. yrlgs.
I-5B	31 acres comm 166 acres cccc 16 sows (2 litters) 9 med. yrlgs.
I-5C	120 acres comm 77 acres cccc 16 sows (2 litters) 11 cows (stanchion) 89 med. yrlgs.
I-5D	112 acres ccom 85 acres cccc 41 sows (2 litters) 26 med. yrlgs.
I-5E	33 acres comm 37 acres ccom 127 acres cccc 37 sows (2 litters) 24 sows (1 litter)
I-5F	150 acres comm 47 acres cccc 25 sows (2 litters) 27 cows (stanchion) 1400 bu. buy corn
I-5G	132 acres comm 65 acres cccc 25 sows (2 litters) 19 cows (stanchion) 26 med. yrlgs. 832 bu. buy corn
I-5H	128 acres comm 69 acres cccc 12 sows (2 litters) 19 cows (stanchion) 71 med. yrlgs.
I-5I	170 acres comm 27 acres cccc 16 sows (2 litters) 35 cows (stanchion) 1185 bu. buy corn
I-5J	197 acres comm 52 cows (parlor) 1529 bu. buy corn
I-5K	180 acres comm 17 acres cccc 42 cows (stanchion) 19 med. yrlgs.
I-5L	131 acres comm 66 acres cccc 19 cows (stanchion) 123 med. yrlgs.


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)
I-5A
I-5B
I-5C
I-5D
I-5E
I-5F
I-5G
I-5H
I-5I
I-5J
I-5K
I-5L

not be profitable to buy them. For this particular farm, an increased price for milk increases milk production, which decreases the relative profitability of corn production because of the need for forage. This decreases the relative profitability of cash-cropping and makes it possible for beef and dairy to be increased simultaneously, since both beef-feeders and dairy cows provide at least part of their chattel. Since the heavy capital investments in cash-cropping are no longer needed, and forage and capital is then available, both dairying and beef production increase with a rise in milk price. Hog production is increased at higher prices for pork so that some forage is required for the spring hogs which are raised on pasture. Hogs and dairy cows prove to be complimentary in production in some areas where (following border prices on the map) dairy cows are profitable at a lower milk price for a hog price of $14.85 per cwt. than is the case for a hog price of $13.80 per cwt. This phenomena occurs because of the hogs becoming profitable enough to use the grain rather than it being used for feeder cattle, which then frees forage for use in dairying. Labor in certain cases is also more evenly used by dairy and hogs than by beef in combination with dairy or hogs.

The price for milk had to be at least $3.77 even at low hog prices, for parlor milking systems to be profitable. Even at the highest milk price considered ($4.20) the loss would be small from not converting to loose housing, but milking the maximum number of 36 cows in stanchion facilities. The highest this income sacrifice would be is about $270. Certainly one would want to be very certain of the high milk price expectation before committing assets to the milking parlor facilities.

Farm 1 - Area II

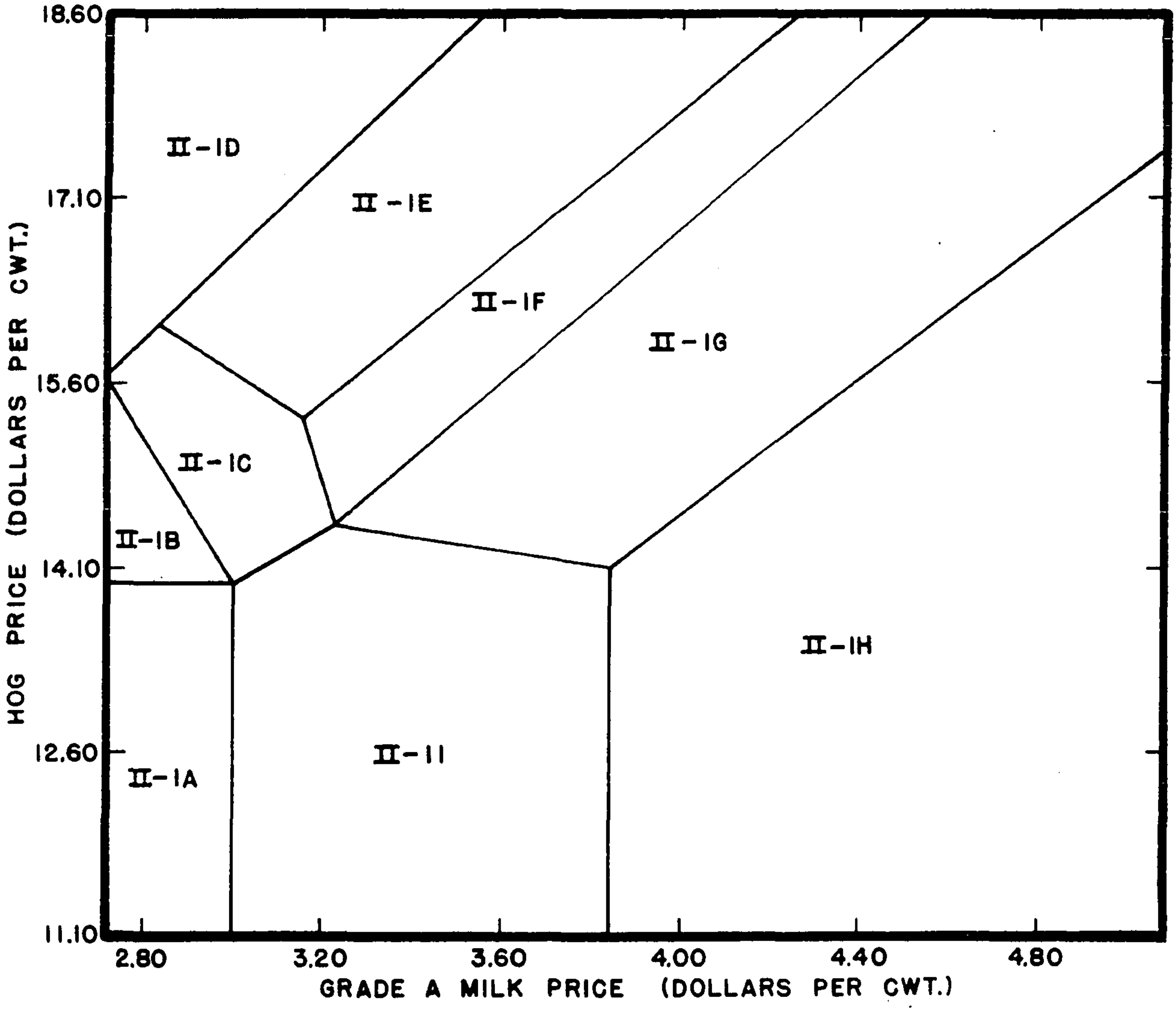
This grade A dairy farm is considerably smaller than the grade A dairy farm of Area I. Labor availability is approximately one and two-thirds man-years, and there are 173 acres of cropland. A shortage of long-term credit capacity restricts this farm to stanchion dairy technology. See figure 12. The shortage of long-term credit capacity is caused by a rather high present indebtedness of some of the farms which fell into the strata making up this representative farm and the lower value of the land in this soil area.

Dairying is profitable in a large proportion of the price area on the map because of higher prices for grade A milk than for manufacturing grade milk. The present stanchion facilities for 41 cows would, optimally, be fully used over a wide range of prices. Dairying is combined with either hogs or feeder cattle depending on hog prices, except in the lower right hand corner of the price map. This farm represents another case of an area of complementarity of milk and hog production. Milk production is profitable at a lower milk price when hogs are priced between $13.94 and $16.65 than when hog prices are either higher or lower. At low hog prices, feeder cattle use the farm resources at milk prices below these at which dairying is profitable. At the middle range of hog prices, a moderate number of hogs are profitable and they draw grain away from feeder cattle which in turn frees forage for dairy cows. At high hog prices, most resources are devoted to hogs except the forage availability makes keeping of a few beef cows profitable. Hogs, feeder cattle and dairy cows are all more profitable than beef cows, except where

Figure 12. Optimal plans for varied prices of milk and hogs for the grade A dairy farm (Farm II-1) in Soil Area II

Code	Enterprises
II-1A	83 acres comm
	90 acres cccc
	183 med. yrlgs.
II-1B	83 acres comm
	90 acres cccc
	20 sows (2 litters)
	117 med. yrlgs.
	1300 bu. buy corn
II-1C	83 acres comm
	90 acres cccc
	29 sows (2 litters)
	11 cows (stanchion)
	33 med. yrlgs.
	1125 bu. buy corn
II-1D	125 acres ccom
	48 acres cccc
	49 sows (2 litters)
	5 beef cows
	2457 bu. buy corn

Code E	Enterprises
II-1E	83 acres comm
	90 acres cccc
	42 sows (2 litters)
	11 cows (stanchion)
	2532 bu. buy corn
II-1F	160 acres comm
	13 acres cccc
	20 sows (2 litters)
	35 cows (stanchion)
	3856 bu. buy corn
II-1G	170 acres comm
	3 acres cccc
	14 sows (2 litter)
	41 cows (stanchion)
	2987 bu. buy corn
II-1H	173 acres comm
	53 cows (stanchion)
	3210 bu. buy corn
II-1I	138 acres comm
	35 acres cccc
	41 cows (stanchion)
	18 med. yrlgs.
	728 bu. buy corn



18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
2.80
3.20
3.60
4.00
4.40
4.80
GRADE A MILK PRICE (DOLLARS PER CWT.)
II-1D
II-1E
II-1F
II-1G
II-1C
II-1B
II-1H
II-1I
II-1A

beef cows are a supplementary enterprise.

In all optimum plans for this farm, except in those where hogs are predominant, forage is a scarce resource. The value of an additional ton of forage is as high as $39.00 per ton. To offset this shortage, corn is ensiled in amounts up to 553 tons which in turn necessitates corn purchases up to approximately 4,000 bushels. Crop sequences range from one-fourth to five-eights in corn with the remainder in oats and meadow. None of the optimum plans have corn production above livestock needs, so no corn selling is profitable.

Farm 2 - Area II

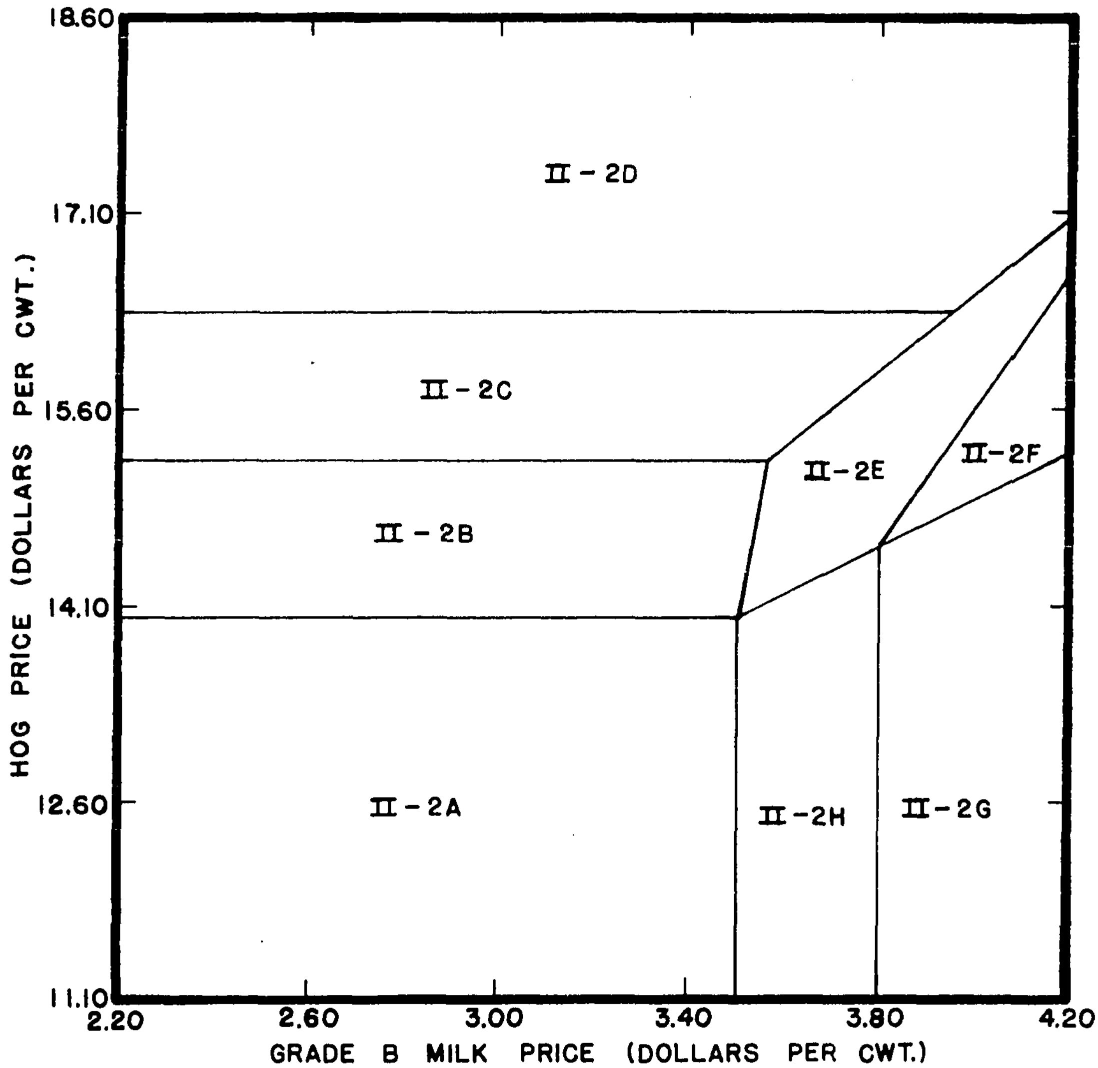
In most of the area of the price map for this small (one man-year labor and 73 acres cropland) farm, feeder cattle and hogs use most of the farm resources. The price map is figure 13 for this farm. Corn and forage production are used in livestock enterprises and additional corn is purchased in most plans. In addition to other forage grown, up to 278 tons of corn silage is needed to meet forage requirements.

Since this farm does not presently have dairy facilities, the break-even point for dairy is at a higher milk price than is the case on other farms which presently have dairy facilities. However, it would pay well for the farm to obtain dairy facilities if the expected price of milk should be very high. For instance, at a hog price of $15.60 per cwt. and a milk price of $4.20 per cwt. the net annual income for the farm plans is nearly $800 higher by including dairying than by not having a dairy enterprise. At $4.00 per cwt. for milk, the income is between $450 and $500 more by including dairying. For lower hog prices the income

Figure 13. Optimal plans for varied prices of milk and hogs for the small non-dairy farm (Farm II-2) in Soil Area II

Code	Enterprises
II-2A	35 acres comm
	35 acres cccc
	79 med. yrlgs.
II-2B	35 acres comm
	33 acres cccc
	8 sows (2 litters)
	60 med. yrlgs.
	1010 bu. buy corn
II-2C	53 acres ccom
	20 acres cccc
	17 sows (2 litters)
	26 med. yrlgs.
	1409 bu. buy corn
II-2D	53 acres ccom
	20 acres cccc
	23 sows (2 litters)
	6 def. fed calves
	8 beef cows
	1700 bu. buy corn

Code	Enterprises
II-2E	47 acres comm
	26 acres cccc
	17 sows (2 litters)
	8 cows (stanchion)
	1855 bu. buy corn
II-2F	54 acres comm
	19 acres cccc
	12 sows (2 litters)
	14 cows (stanchion)
II-2G	73 acres comm
	23 cows (stanchion)
	1246 bu. buy corn
II-2H	39 acres comm
	34 acres cccc
	16 cows (stanchion)
	33 med. yrlgs.
	1026 bu. buy corn


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
II - 2D
II - 2C
II - 2B
II - 2E
II - 2F
II - 2A
II - 2H
II - 2G
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)

differential is even greater. As an example, at hog prices of $14.10 per cwt. or lower, and at $4.20 per cwt. for milk, income is reduced by nearly $1500 by not building the dairy facilities and including the dairy enterprise. Net farm incomes vary from $4,625 to $8,238 depending on the prices for milk and hogs. Other characteristics of this farm plan are also found in Appendix E.

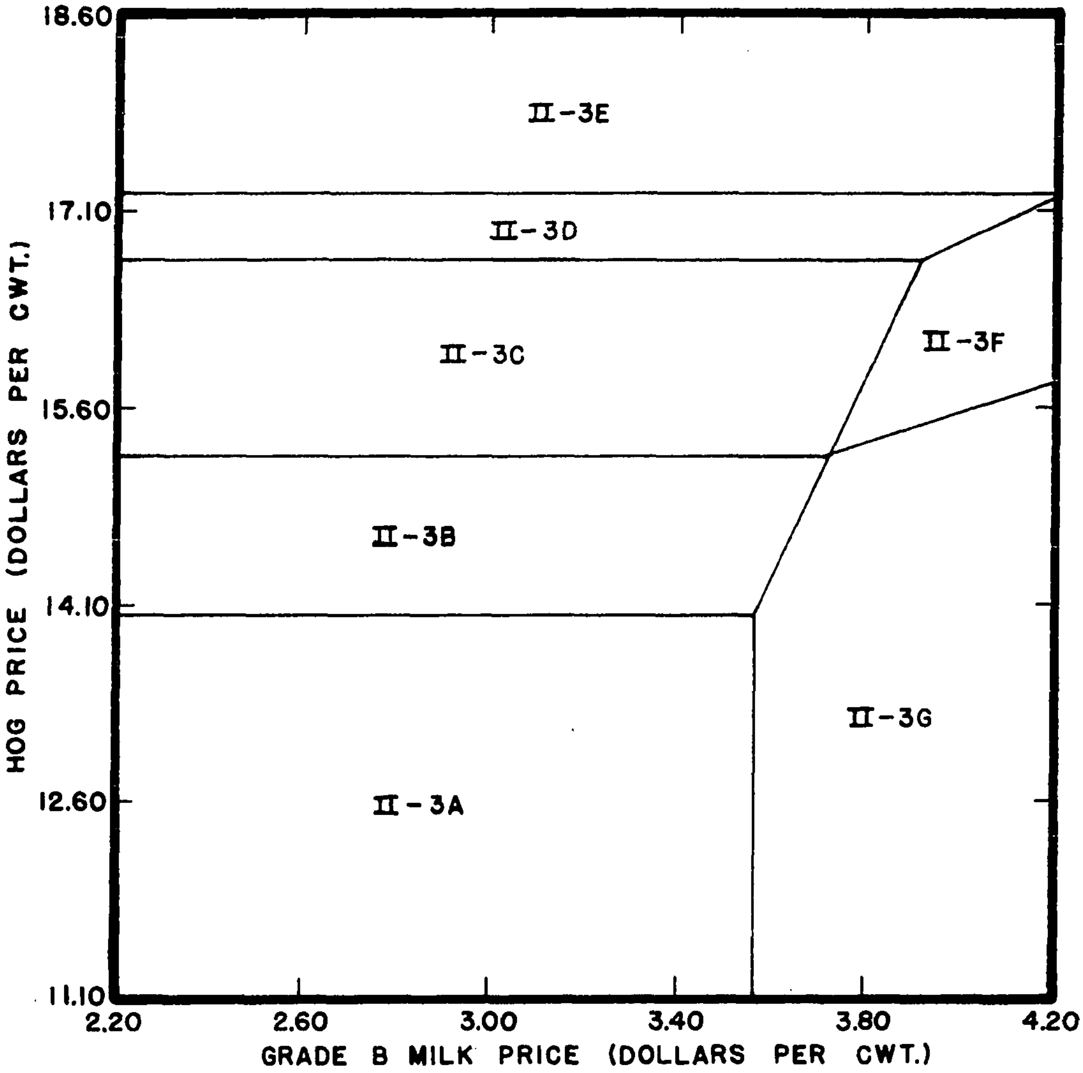
Farm 3 - Area II

The resources of this farm type include about one man-year of operator and family labor, in addition to about one-half man-year labor which has been hired. There is 190 acres of cropland and substantial capital available for both short- and long-run uses. The rather short labor supply in relation to the size of farm and the availability of capital makes feeder cattle profitable over most of the price area (figure 14). Also, parlor housing is used whenever dairying is introduced into the optimum plans for this farm. In fact, at high milk prices (say $4.20 per cwt.) the loss from building stanchion facilities rather than parlor housing would amount to about $2400 net income per year (at hog prices below $14.10 per cwt.). The loss, using the same circumstances except $15.60 per cwt. hog price would be about $1800 per year. The loss from not having any dairy facilities (as the farms in this strata presently do not have) at a price of $4.20 for milk ranges up to nearly $3800 for low hog prices. But, present levels of milk prices do not warrant production of milk on this farm.

Cropping sequences are one-fourth corn where dairy production is heavy and about five-eights corn in various rotations in the price ranges

Figure 14. Optimal plans for varied prices of milk and hogs for the large non-dairy farm (Farm II-3) in Soil Area II

Code	Enterprises
II-3A	94 acres comm
	96 acres cccc
	202 med. yrlgs.
II-3B	97 acres comm
	93 acres cccc
	3 sows (2 litters)
	189 med. yrlgs.
II-3C	45 acres comm
	70 acres ccom
	75 acres cccc
	28 sows (2 litters)
	106 med. yrlgs.
	1764 bu. buy corn
II-3D	137 acres ccom
	53 acres cccc
	44 sows (2 litters)
	41 med. yrlgs.
	2510 bu. buy corn
II-3E	137 acres ccom
	53 acres cccc
	47 sows (2 litters)
	14 sows (1 litter)
	5 beef cows
	2817 bu. buy corn
II-3F	190 acres comm
	10 sows (2 litters)
	46 cows (parlor)
	3170 bu. buy corn
II-3G	190 acres comm
	47 cows (parlor)
	868 bu. buy corn


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
II-3E
II-3D
II-3C
II-3F
II-3B
II-3G
II-3A
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)

where feeder cattle and hogs are dominant in the plans. The supply of roughage is sufficient to justify a few beef cows along with the 108 litters of hogs at the highest level of hog prices used. Nevertheless, the marginal value products for roughage are quite high on this farm for the plans where feeder cattle and especially dairy cows are in the optimum plans. The forage has little value in the plans for high hog prices where hogs are profitable in large numbers. Except where dairying is profitable, corn silage production is not profitable in amounts larger than that which could be handled in one tower silo. Harvesting of up to about 250 tons of corn silage provides roughage where dairy herds are large.

Farm 4 - Area II

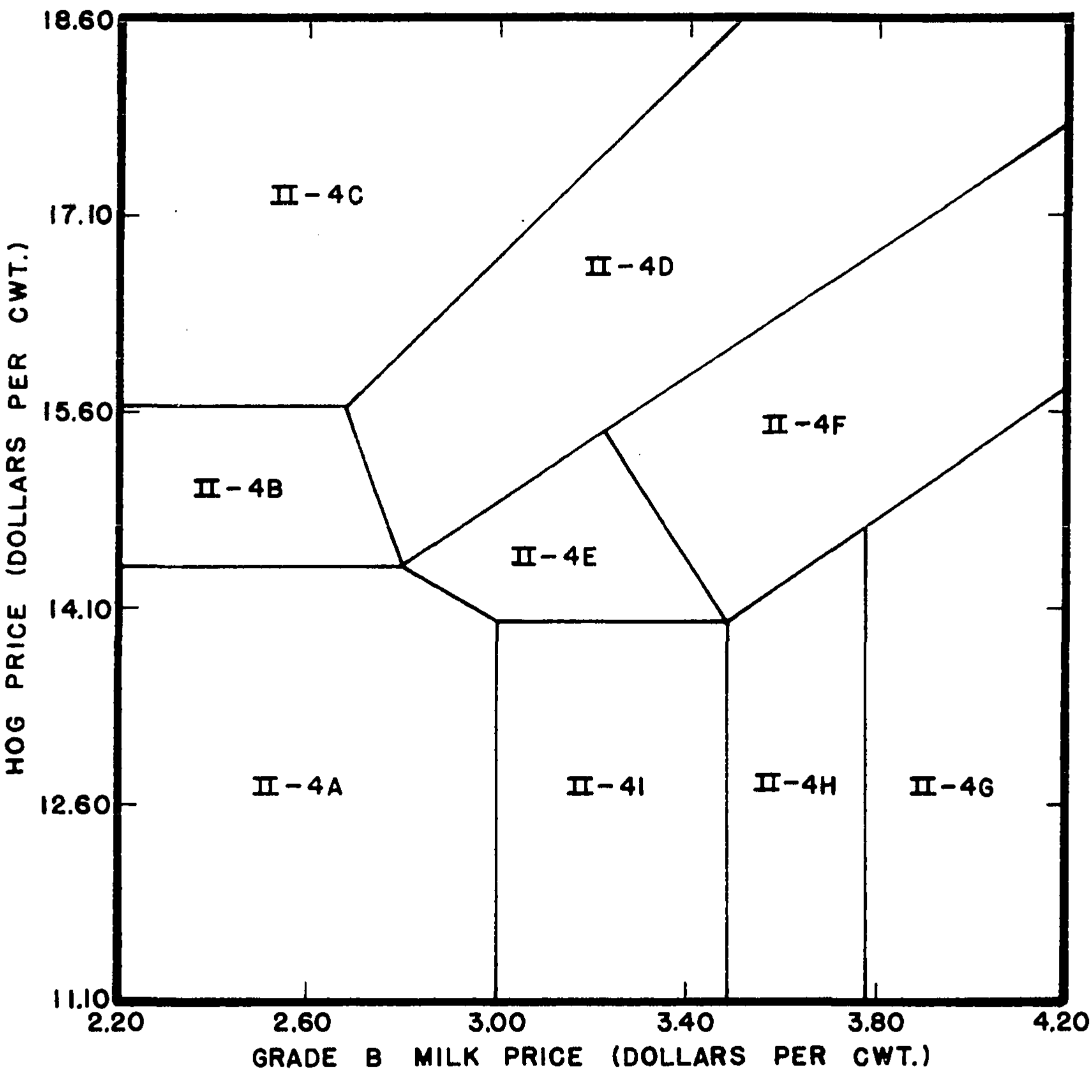
This small dairy farm has 91 acres of cropland, about one and one-fourth man-years of labor, and stanchion facilities for 16 dairy cows. The resources of the farm are not sufficient to support very large enterprises of any type. The feed, labor and capital available limit dairying to stanchion facilities with less than 30 cows. Dairying is limited to no more than use of present facilities in most of the price map for this farm (figure 15). Only the extreme southeast corner of the price map has plans in which it would be profitable to expand dairy facilities. This price map illustrates another instance of the complementary of hogs and milk in production in certain price combinations. The lowest milk prices at which milk production is profitable occur between the prices of $13.90 and $16.80 for hogs. Thus, there are both competitive and complementary ranges of production for milk and pork.

Land is one of the most limiting resources on this farm. The marginal

Figure 15. Optimal plans for varied prices of milk and hogs for the small dairy farm (Farm II-4) in Soil Area II

Code	Enterprises
II-4A	35 acres comm 13 acres ccom 43 acres cccc 104 med. yrlgs. 80 bu. buy corn
II-4B	66 acres ccom 25 acres cccc 20 sows (2 litters) 1007 bu. buy corn
II-4C	65 acres ccom 26 acres cccc 25 sows (2 litters) 7 beef cows 1170 bu. buy corn
II-4D	44 acres comm 47 acres cccc 22 sows (2 litters) 8 cows (stanchion) 1177 bu. buy corn
II-4E	44 acres comm 47 acres cccc 5 sows (2 litters) 16 cows (stanchion) 18 med. yrlgs.

Code	Enterprises
II-4F	44 acres comm 47 acres cccc 14 sows (2 litters) 16 cows (stanchion) 1237 bu. buy corn
II-4G	91 acres comm 29 cows (stanchion) 19 med. yrlgs. 1533 bu. buy corn
II-4H	73 acres comm 18 acres cccc 27 cows (stanchion) 18 med. yrlgs. 1600 bu. buy corn
II-4I	44 acres comm 47 acres cccc 16 cows (stanchion) 41 med. yrlgs.


18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS PER CWT.)
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS PER CWT.)
II-4C
II-4D
II-4B
II-4F
II-4E
II-4A
II-4I
II-4H
II-4G

value products for land shown in Appendix E range up to $78 per acre per year. Short-term credit also is very limiting at the high hog prices where additional capital in the plans would return as high as 65 percent. Labor is plentiful in most cases.

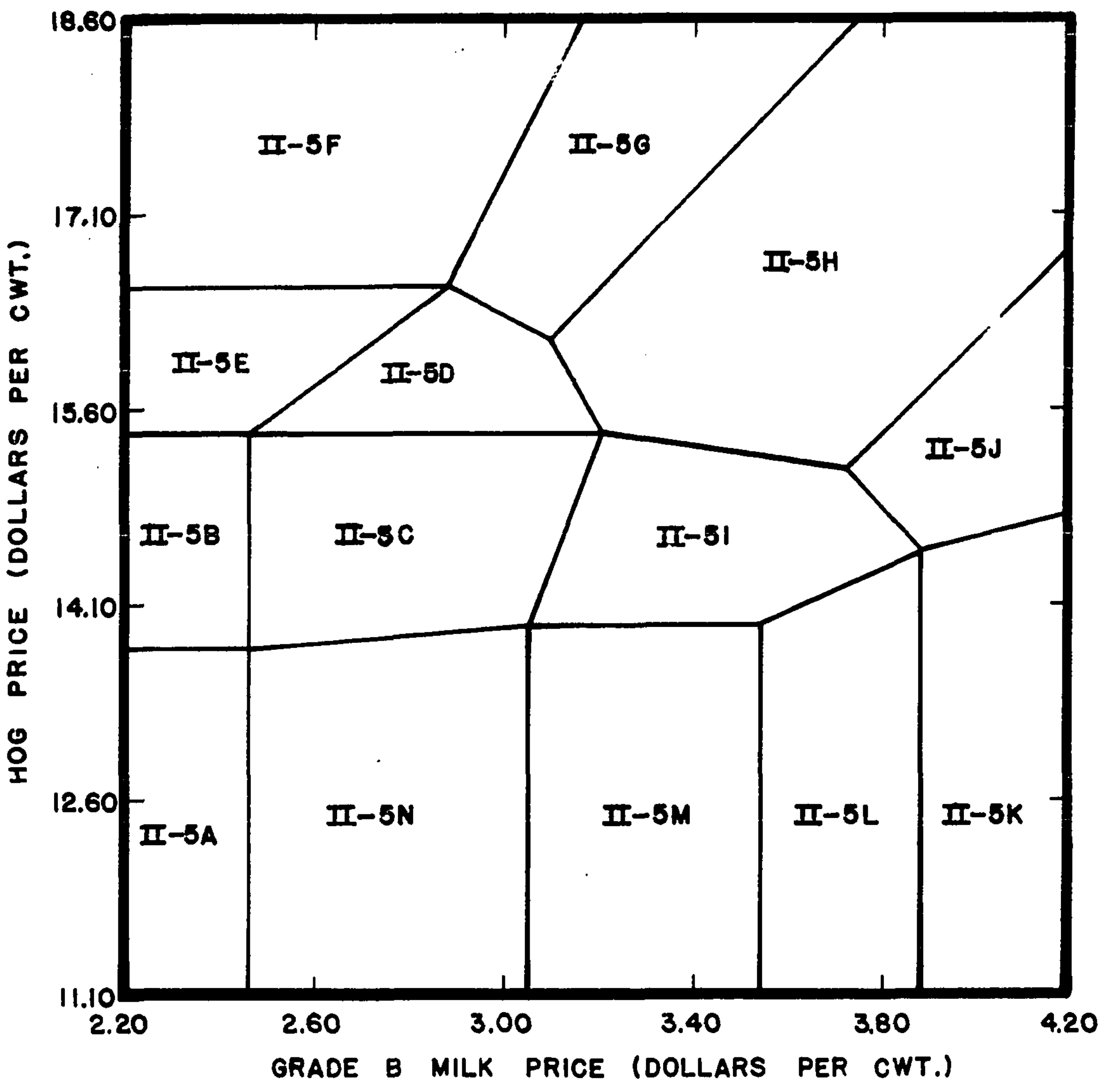
Farm 5 - Area II

Farm plans for the large dairy farm in the Fayette soil area show dairying to be profitable at relatively low milk prices (figure 16). These dairy enterprises at the low milk prices are relatively small in terms of cow numbers (8 to 12 cows) when compared to other farms where the number of cows is frequently the limit of present facilities at the minimum milk price which makes dairying profitable. The limitation of short-term credit which makes intensive corn-cropping most profitably and reduces feeder cattle operations causes dairying to be profitable at lower than usual prices. Availability of forage from 72 acres of permanent pasture also makes dairying, as well as the deferred fed calves, relatively more profitable than on some farms. Use of full capacity of present dairy facilities would be most profitable over a substantial range of prices that begins at $3.05 or higher per cwt. for milk. Parlor housing with about 50 of cows is in the optimum plan where milk prices are particularly favorable relative to other prices. The advantage of parlor housing is only slight, however. The greatest income advantage to parlor housing is about $400 and occurs at the point where milk price is $4.20 per cwt. and hog price is $15.60 per cwt. At hog prices below about $14.75 the advantage of converting to parlor housing amounts to $100 or less in net income per year. Thus, parlor and loose housing facilities will probably never be

Figure 16. Optimal plans for varied prices of milk and hogs for the large dairy farm (Farm II-5) in Soil Area II

Code	Enterprises
II-5A	215 acres ccom 213 med. yrlgs.
II-5B	144 acres ccom 66 acres cccc 20 sows (2 litters) 141 med. yrlgs.
II-5C	110 acres comm 105 acres cccc 11 sows (2 litters) 8 cows (stanchion) 153 med. yrlgs.
II-5D	103 acres comm 112 acres cccc 37 sows (2 litters) 10 cows (stanchion) 48 med. yrlgs. 761 bu. buy corn
II-5E	155 acres ccom 60 acres cccc 40 sows (2 litters) 37 med. yrlgs. 20 def. fed calves 970 bu. buy corn
II-5F	155 acres ccom 60 acres cccc 54 sows (2 litters) 12 beef cows 1620 bu. buy corn
II-5G	195 acres ccom 20 acres cccc 46 sows (2 litters) 4 sows (1 litter) 12 cows (stanchion) 2042 bu. buy corn

Code	Enterprises
II-5H	133 acres comm 82 acres cccc 40 sows (2 litters) 21 cows (stanchion) 1885 bu. buy corn
II-5I	139 acres comm 76 acres cccc 14 sows (2 litters) 21 cows (stanchion) 77 med. yrlgs.
II-5J	215 acres comm 13 sows (2 litters) 50 cows (parlor) 3359 bu. buy corn
II-5K	215 acres comm 52 cows (parlor) 407 bu. buy corn
II-5L	207 acres comm 8 acres cccc 40 cows (stanchion) 43 med. yrlgs.
II-5M	158 acres comm 57 acres cccc 21 cows (stanchion) 133 med. yrlgs.
II-5N	129 acres comm 86 acres cccc 10 cows (stanchion) 187 med. yrlgs.


II-5F
II-5G
II-5H
II-5E
II-5D
II-5J
II-5B
II-5C
II-5I
II-5A
II-5N
II-5M
II-5L
II-5K
18.60
17.10
15.60
14.10
12.60
11.10
2.20
2.60
3.00
3.40
3.80
4.20
HOG PRICE (DOLLARS PER CWT.)
GRADE B MILK PRICE (DOLLARS PER CWT.)

optimum for this type of farm, since the likelihood of prices near $4.00 per cwt. for manufacturing grade milk seems quite remote. Even if prices developed so that the parlor housing was optimum, considerations of risk aversion and dislike for indebtedness would likely deter many from the heavy investment in dairy buildings. Substantial losses would result from converting to parlor milking facilities if the high price for milk did not materialize. For instance, at a price of $15.60 for hogs the loss in annual income from building a complete parlor and loose-housing milk set-up would be about $1150 per year at a $3.40 per cwt. milk price.

General characteristics of farm plans

There are some general characteristics of the farm plans which should be useful in farm planning. In the first place, intensive cropping is the most profitable use of farm resources unless milk prices are higher than would ordinarily be expected in the next few years. In every instance the optimal plans use the fertilized crop rotation rather than the non-fertilized rotation. In most cases the grain and forage production in the plans is fed to either beef, hogs, or dairy cows. Corn silage is used extensively to augment the forage supply. The heaviest concentration of meadow in cropping sequences is ordinarily not used in the farm plans except at the maximum possible dairy production which is associated with very high milk prices.

All farm plans have at least a few feeder cattle where hog and milk prices were low. On some farm plans (where adequate short-term credit is available) the plans have approximately one feeder steer per acre of cropland. Hogs become competitive with beef and dairying at about $14.00

per cwt. for pork, except where milk price is quite high. At high milk prices, most farm resources are devoted to dairying. At prices above about $15.00 to $16.00 per cwt. for hogs, optimal plans have rather heavy concentration on hogs unless the milk price is high enough to draw resources to dairying. To some extent, feeder cattle, a few beef cows or dairy cows are in optimal plans along with substantial hog production to make use of certain resources, particularly forage supplies which the hogs do not exhaust.

Dairy production becomes profitable (at low hog prices) at around $2.50 per cwt. where short-term capital is scarce relative to other resources, and where dairy facilities are presently available. Where capital is more plentiful the resources are devoted mainly to feeder cattle unless milk is priced above approximately $3.00 per cwt. Where dairy facilities are not presently available, milk price must be approximately $3.50 per cwt. to warrant production of milk. Expansion of dairy facilities beyond present capacity on any type of farm requires about a $0.50 rise in milk price above the price at which present facilities are fully utilized, or usually a milk price above about $3.50 per cwt.

Supply Functions for Milk and Hogs

Supply functions for both milk and hogs were obtained from the set of optimum plans for each farm. Supply functions for milk are of a stepped nature and show the exact milk price boundaries of the optimum plans. Milk supply functions were obtained at each of the six hog price levels investigated. Since no hog production is profitable on any of the farms at hog prices of \$11.10 and \$12.60 per cwt., the plans and milk supply functions are identical at these lowest two hog prices. Therefore, there are only five supply functions for milk; one applies to two hog prices.

Only seven points (some at zero production) were determined on the six hog supply functions which were obtained for each of six milk prices. These points were at hog prices of \$11.10 per cwt. and five higher prices spaced at \$1.50 increments in addition to the exact minimum hog price at which production of hogs became profitable.

The supply functions and cross-supply functions presented in this section are aggregate functions where the aggregate is computed by taking $\sum_{c=1}^{10} w_i q_i$ at each p_j. The w_i are the number of farms represented by the ith stratum (representative farm), where all commercial farms in Economic classes I - V (1954 definition) in the 17 county area in northeastern Iowa are allocated to one of the strata. The q_i are the optimum quantities of milk, hogs or beef for the ith strata, where q_i varies as p_j (price of the products) changes. The allocation of the 29,361 farms in the two areas to one of the strata is shown in table 5.

In the supply functions, the contributions of each of the farm types (stratum) to the aggregate supply functions are shown along with the aggregate quantities. The weighted individual farm supply functions were accumulated to form the aggregate functions. The contribution from all farms of each type is shown added to that of the previous type rather than plotted on an axis of its own. A comparison of production of various items from individual farms can be obtained from the price maps in the preceding

Table 5. Computation of number of farms (Census economic classes I-V, 1954 definition) represented by each stratum or representative farm[a]

Area	No. of farms class I-V (1959 Census)	Estimated no. of class VI farms in 1959 with sales $1200	No. of farms in 1959 in classes I-V (1954 definition)	Stratum	No. of farms in sample survey	Percent of area's farms (from sample)	Total farms represented by strata
	No. of farms	No. of farms	No. of farms		No. of farms	Percent	No. of farms
				I-1	8	7.767	1,421
				I-2	11	10.680	1,954
I	17,858	441	18,299	I-3	13	12.621	2,310
				I-4	38	36.893	6,751
				I-5	33	32.039	5,863
					103	100.000	18,299
				II-1	4	3.883	430
				II-2	6	5.825	644
II	10,679	383	11,062	II-3	14	13.592	1,504
				II-4	46	44.661	4,940
				II-5	33	32.039	3,544
					103	100.000	11,062

[a]Data from Census of Agriculture 1940 through 1959, (66, 67, 68, 69 and 70). Only commercial farms of Economic Class I-V (1954 definition) where gross sales were greater than $1200 were considered relevant for farm planning and for deriving supply curves for products.

section, or from the data of Appendix E.

Aggregate supply functions of the type given here are meaningful in showing optimum production from an entire area at various price levels. The supply functions assume adjustments from the present set of resources and distribution of farm types and sizes. The aggregate supply functions shown here do not cover all production areas with which this region competes, nor can a consumption area be delimited which could be called an isolated market area. Therefore, no estimate of the equilibrium prices and quantities can be made. Certain comparisons can be made, however, such as the normative or optimum output at present and projected prices, price at which present or needed production would optimally be attained and price changes needed for certain production changes. By relating the supply curves with the price maps, optimum spatial location of production among the areas, as well as production among farm types can be determined even at prices which are quite different from those prevailing at present. Such information could be very useful for policy-making.

Supply functions and cross-supply functions for grade B milk

The supply functions shown in figures 17 through 21 represent aggregate grade B milk supply functions corresponding to levels of hog prices used in programming. The contribution of the farms of each type to the aggregate supply is also shown as the areas between the lighter lines on these figures. In each case a least squares regression line has been fitted to the aggregate supply function. The supply elasticities at selected points on the aggregate functions are given in table 6. The five aggregate stepped supply functions, one for each hog price, are compared

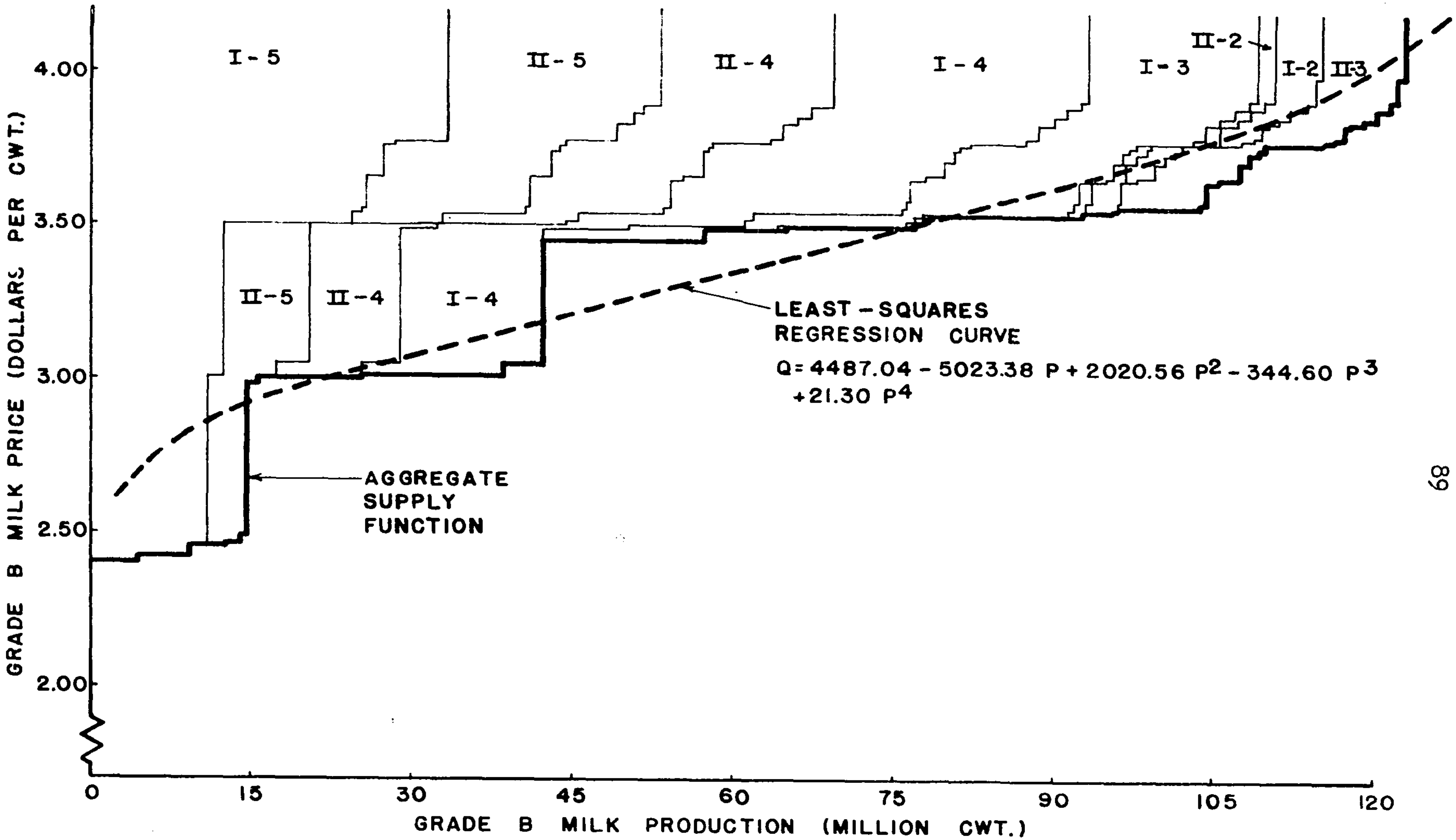


Figure 17. Aggregate stepped and smoothed supply function for grade B milk, showing the contribution of each type of farm, for hog prices \$11.10 and \$12.60 per cwt.

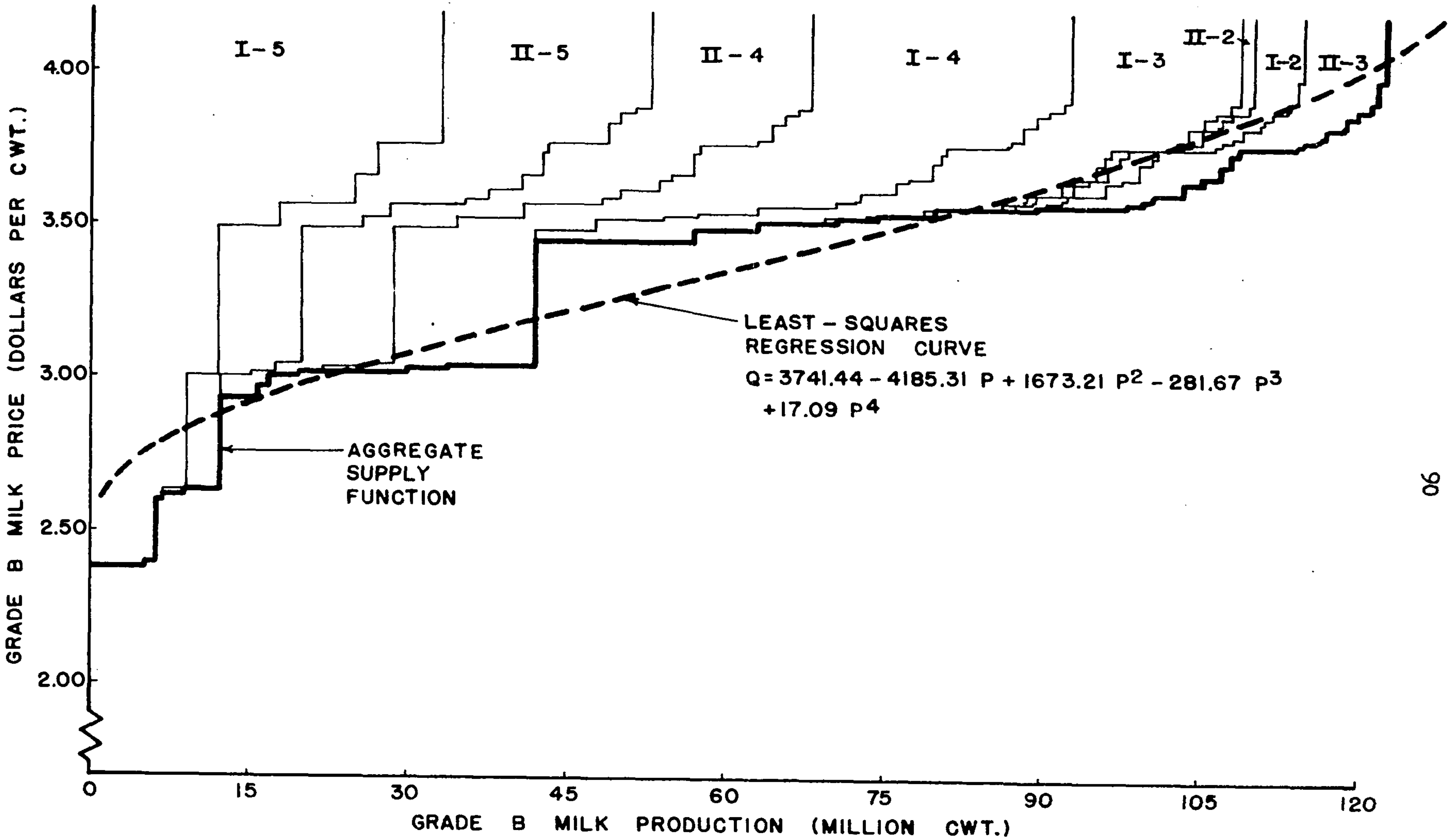


Figure 18. Aggregate stepped and smoothed supply function for grade B milk, showing the contribution of each type of farm, for hog price $14.10 per cwt.

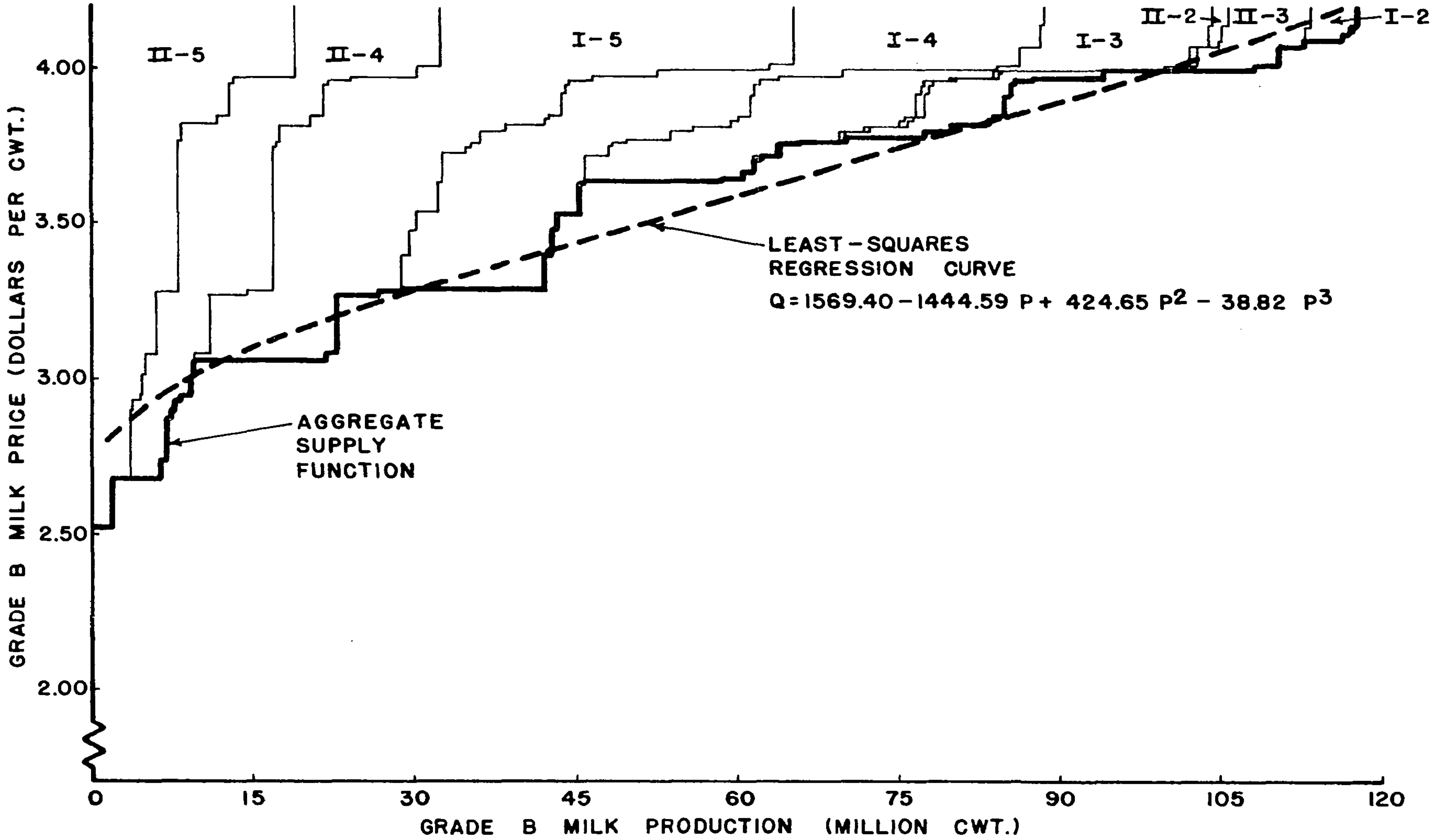


Figure 19. Aggregate stepped and smoothed supply function for grade B milk, showing the contribution of each type of farm, for hog price $15.60 per cwt.

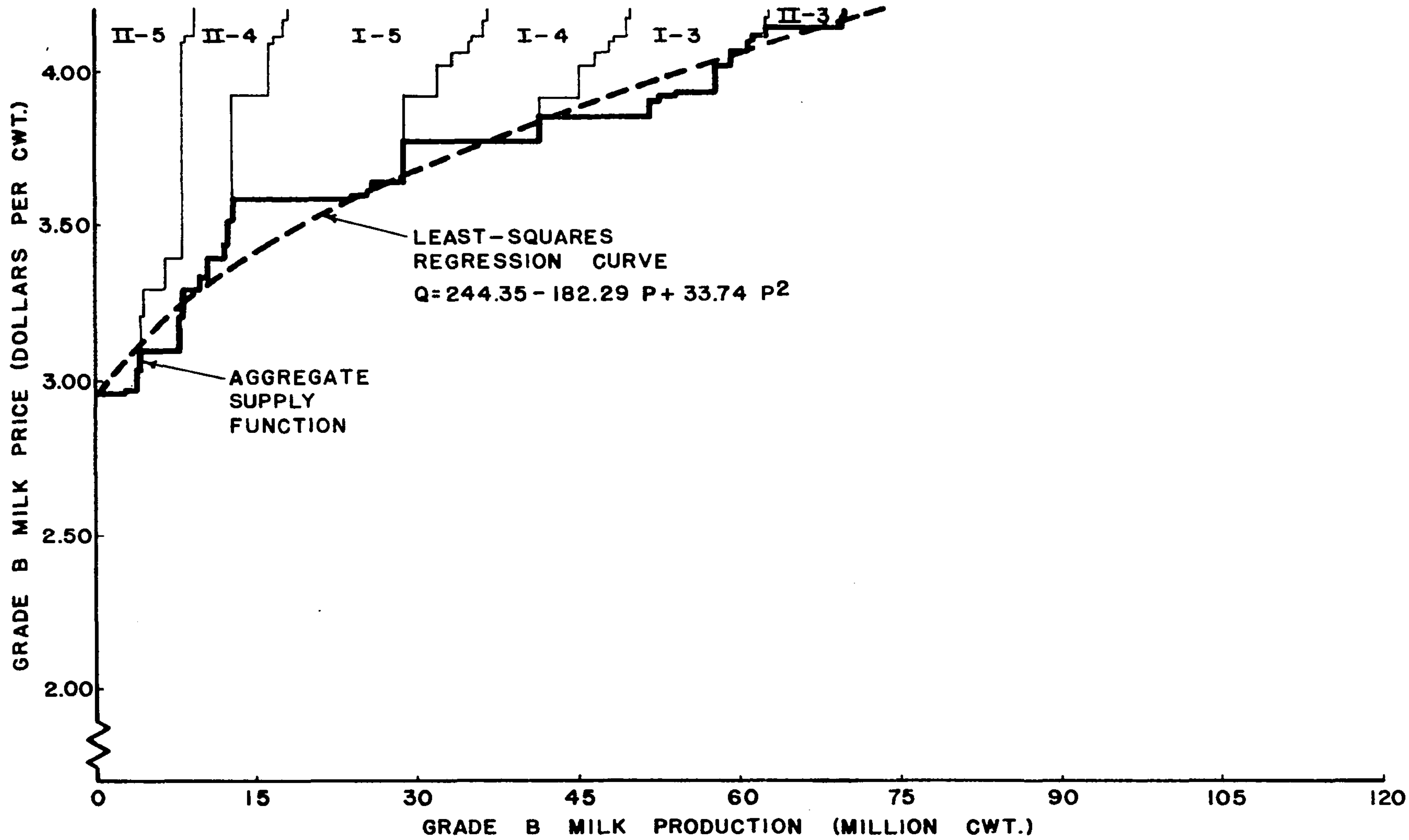


Figure 20. Aggregate stepped and smoothed supply function for grade B milk, showing the contribution of each type of farm, for hog price $17.0 per cwt.

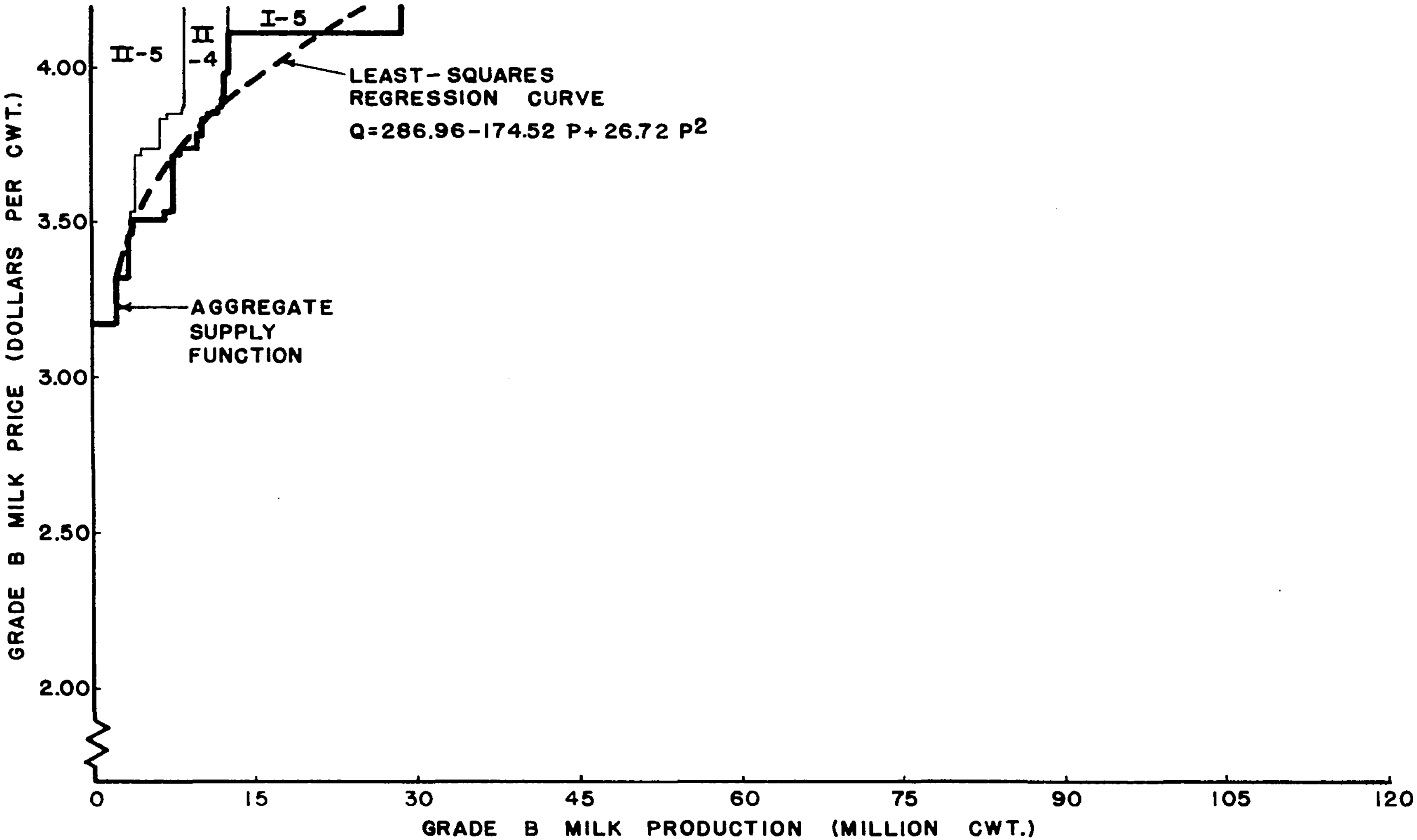


Figure 21. Aggregate stepped and smoothed supply function for grade B milk, showing the contribution of each type of farm, for hog price $18.60 per cwt.

Table 6. Supply elasticities at selected milk and hog prices from fitted regression curves of aggregate grade B milk supply[a]

Hog price (dollars per cwt.)	Grade B milk price (dollars per cwt.) 2.60	3.00	3.40	3.80	4.20	R^2 from regression
11.10 or 12.60	-	12.78	5.84	2.88	0.82	0.95
14.10	-	8.48	3.82	1.21	-	0.96
15.60	-	17.50	8.00	4.70	2.41	0.97
17.10	-	53.30	10.90	7.23	5.73	0.98
18.60	-	-	9.72	11.20	8.27	0.89

[a]Elasticities computed by using the formula $E = \frac{dq}{dp} \cdot \frac{P}{q}$.

in figure 22. The supply schedules are also given in table 7 for selected prices.

In general, the supply elasticities of table 6 are very high compared with those obtained by time series analysis. Barker (4, p. 194) gives elasticities of supply for milk of 0.30 to 0.35. His estimates are from a time series analysis of the Lake States. The two types of elasticities have different meanings. The time series analysis represents historical events encompassing all of the lags and inflexibilities from uncertainty and resistance to change. The time series estimates also include areas where production alternatives for dairying are poor. The elasticity coefficients derived from linear programming results are different in several respects. They are from normative supply functions which assume optimal adjustments for profit-maximizing motivations with perfect knowledge. The possibility of using higher technology is included in the linear programming analysis. The linear programming study for Iowa also applies to an area where alternative enterprises compete closely for resources.

The normative, aggregate supply functions for grade B milk have several characteristics in common. For low hog prices, there are three horizontal and three vertical segments on the stepped supply functions which can be identified. The first horizontal segment, at milk prices of about $2.50 per cwt. includes milk production from farms where capital is in relatively short supply. The first vertical segment defines full use of present facilities on these two farms. The second horizontal segment, at milk prices around $3.00 per cwt., represents movement to full use of present dairy facilities on all farm types. The second vertical segment

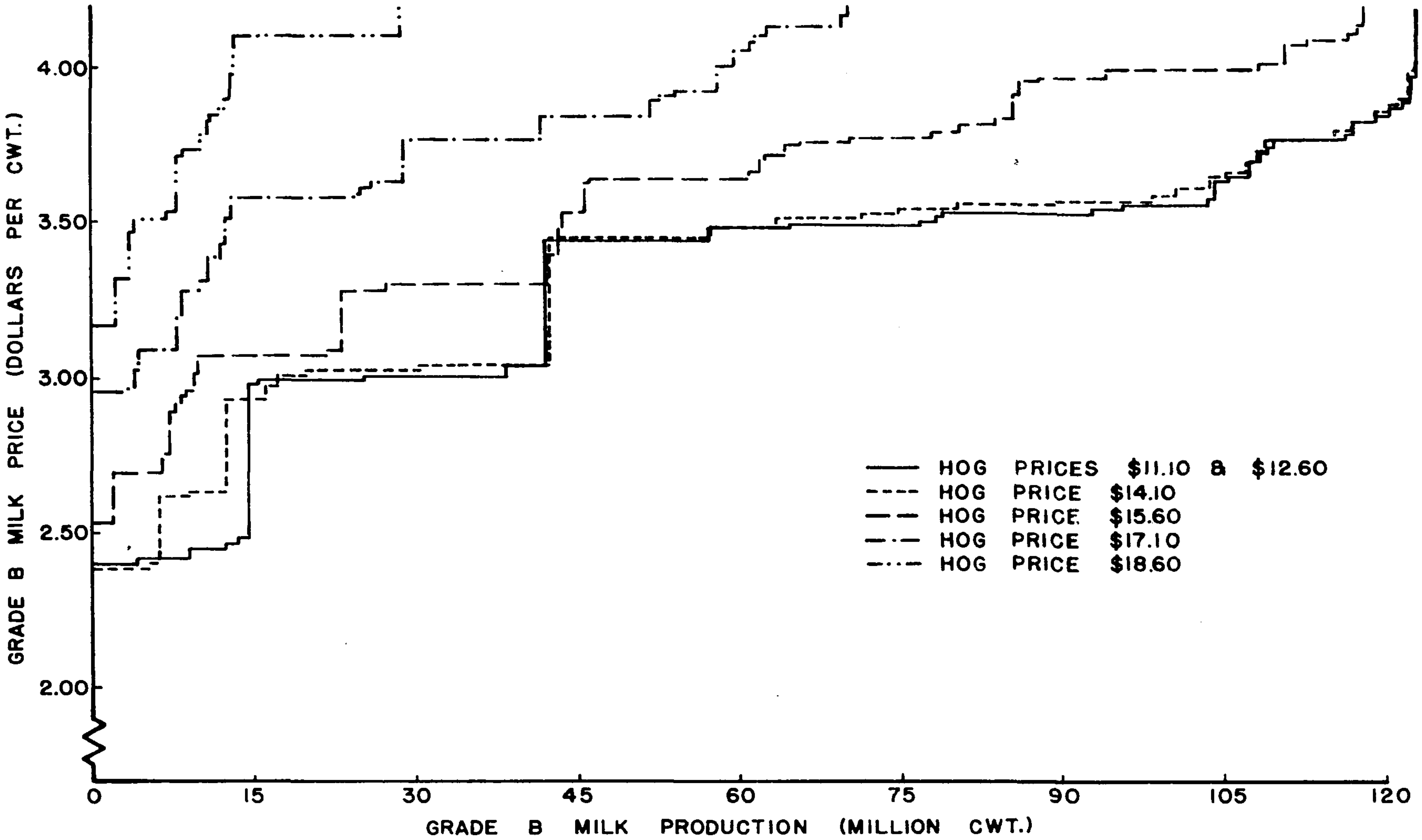


Figure 22. Aggregate stepped supply functions for grade B milk for each of six hog prices

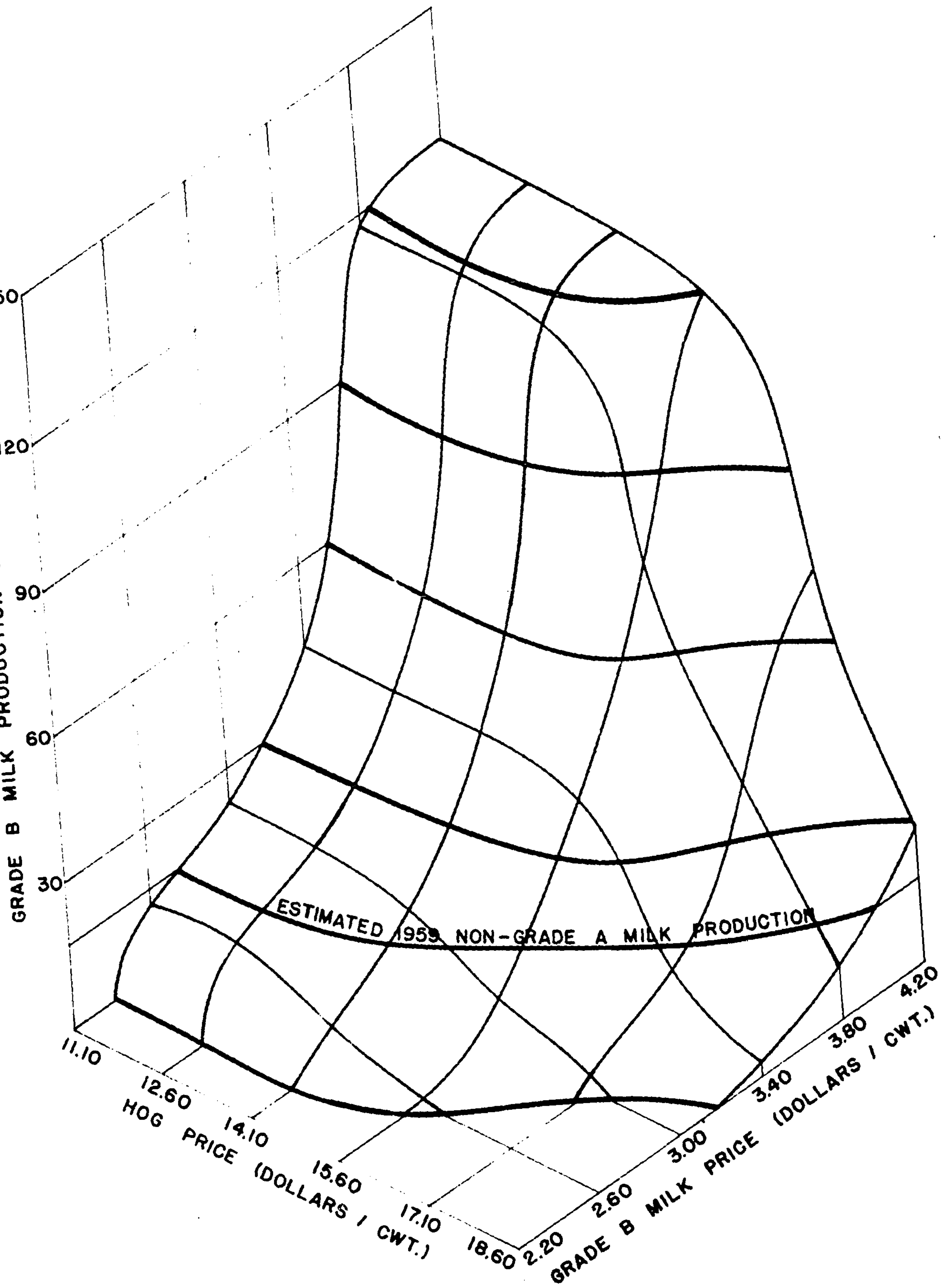
Table 7. Aggregate grade B milk production from programming results by milk price, by hog price

Milk price (dollars per cwt.)	Hog price (dollars per cwt.) 11.10 million cwt.	12.60 million cwt.	14.10 million cwt.	15.60 million cwt.	17.10 million cwt.	18.60 million cwt.
2.20	0	0	0	0	0	0
2.60	14.57	14.57	7.0	0	0	0
3.00	25.1	25.1	19.6	9.5	4.0	0
3.40	42.1	42.1	42.1	43.1	12.0	3.2
3.80	117.3	117.3	117.2	73.2	39.2	10.4
4.20	123.0	123.0	123.0	118.0	70.4	28.7

represents the limits of present dairy facilities. Then, the third horizontal segment, at milk prices near $3.50 or slightly more, per cwt., represents expansion of present facilities, conversion to milking parlors on some farms and adding of either stanchion or parlor facilities where none are available. The third vertical segment at the extreme right side of the functions indicates that the opportunity costs for higher milk production are very great and the physical maximum level of production (under the linear programming resource restraints) is nearly attained. Milk supply functions for higher hog prices are further left since opportunity costs rather than physical restrictions limit milk supply.

A production surface (figure 23) which was fitted by hand-smoothing,

Figure 23. Aggregate production of grade B milk for various milk and hog prices


GRADE B MILK PRODUCTION (MILLION CWT.)
30
60
90
120
150
11.10
12.60
14.10
15.60
17.10
18.60
HOG PRICE (DOLLARS / CWT.)
2.20
2.60
3.00
3.40
3.80
4.20
GRADE B MILK PRICE (DOLLARS / CWT.)
ESTIMATED 1959 NON-GRADE A MILK PRODUCTION

shows the relationship between optimum levels of manufacturing grade milk production in the aggregate and milk price and hog price. Here again the very responsive portion of the milk price range is shown to be between \$3.40 and \$3.80 per cwt. These prices are somewhat higher than has prevailed in the past and higher than expected for the near future. Thereby, there has not been, and likely will not be soon any opportunity to see what farmers' actual reactions to this high level of prices might be.

From the 1959 Census of Agriculture (70), United States Department of Agriculture Statistical Bulletin No. 282 (75) and the survey taken at the outset of this study, milk production other than for grade A use is estimated to have been 17.2 million cwt. in 1959 for the area covered by this study. Cream production was included as its milk equivalent. The estimated 1959 production is plotted as a contour on figure 23 for comparison to optimum levels of production at the various price combinations. Total production in 1959 was not far from the optimum level according to the programming results for the prices that prevailed then. However, in the optimum plans milk production occurs on the two large dairy farms and not on the two small dairy farms. Also, in the optimum plans there would be fewer but higher-producing cows contributing to the milk supply. The optimum plans have more specialized dairy operations or else no dairying at all on individual farms.

Figure 24 and table 8 show that there is a very strong relationship between milk production and hog price. Cross-elasticities are very high for the higher ranges of hog prices where resources can be drawn from dairying by profitable hog enterprises. The one positive cross-elasticity

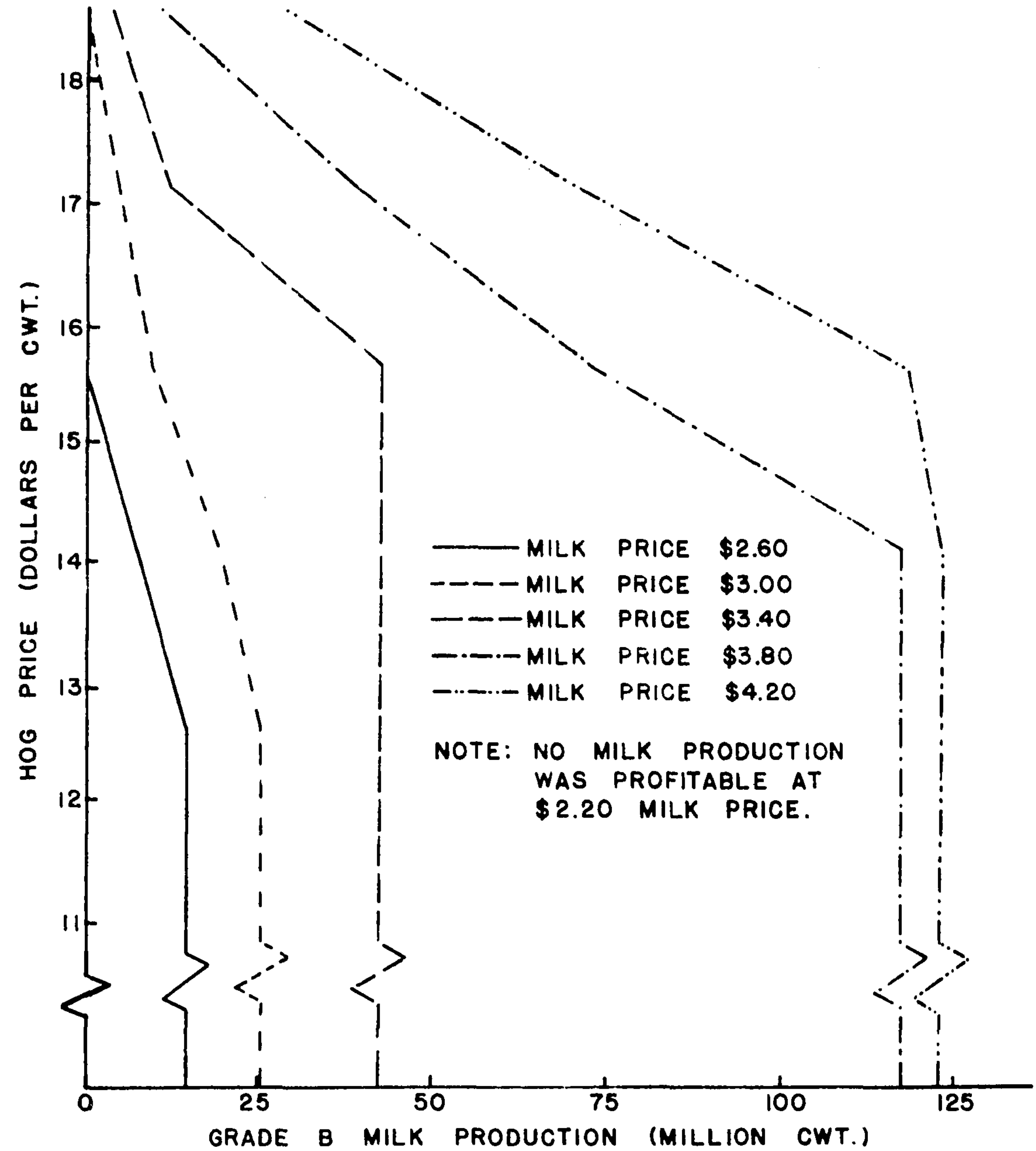


Figure 24. The relationship of aggregate grade B milk production to the price of hogs

Table 8. Cross-elasticities of supply at selected milk and hog prices for aggregate grade B milk production with respect to hog prices[a]

Hog price (dollars per cwt.)	Milk price (dollars per cwt.)				
	2.60	3.00	3.40	3.80	4.20
11.10 to 12.60	0	0	0	0	0
12.60 to 14.10	-6	-2.20	0	0	0
14.10 to 15.60	-19.80	-6.88	+0.22	-4.57	-0.41
15.60 to 17.10	-	-9.11	-12.30	-6.60	-5.51
17.10 to 18.60	-	-23.80	-13.80	-13.82	-10.03

[a]Are elasticities computed by the formula $E = \frac{q_1 - q_2}{p_1 - p_2} \cdot \frac{p_1 + p_2}{q_1 + q_2}$.

is caused by a case of complimentarity between hogs and dairy cows where hogs become profitable enough to draw some resources from beef-feeding but this frees some roughage for use in dairying. For the most part, dairy and hogs are competitive enterprises.

Supply and cross-supply functions for grade A milk

The grade A milk supply functions have fewer steps in the step functions than do the grade B milk supply functions since only two farms have grade A capabilities. The grade A dairy farm in Area I (Carrington-Clyde soil area) represents many more farms than the grade A dairy farm in Area II, and also is a larger farm. The contribution from the farm in

Area I to the aggregate supply, therefore, is much greater, as shown in figures 25 to 29. The aggregate supply functions for each hog price are compared in figure 30.

The supply functions over most of the range of milk prices show high elasticities. Optimum response to price changes brings large changes in quantity. Supply elasticities computed from the fitted regression lines on the aggregate supply functions are shown in table 9. These elasticities too, are much higher than those obtained by time series estimates. The hand-smoothed production surface is shown in figure 31. Figure 31 again emphasizes the strong response to milk price changes as well as to changes in hog prices. The estimated 1959 grade A eligible milk production in this 17 county portion of Iowa is shown as a contour on this surface. The source of data is the same as for estimated 1959 non-grade A milk production. Optimum production quantities at selected milk and hog prices are shown in table 10 as well as on the production surface. Maximum quantities of milk production for each of the supply functions i.e., for any hog price in figures 25 to 29 and in figure 30 are approximately the same, indicating that grade A milk production is profitable enough at the highest milk prices (up to $5.20 per cwt.) to maximize milk production even with the price of hogs as high as $18.60 per cwt.

Cross-elasticities of supply shown in table 11, range from zero to -43.80 for grade A milk production with respect to hog prices. These cross-elasticities are elasticities computed over $1.50 ranges in hog prices. The cross-supply functions for each hog price are shown in figure 32. Where the cross-elasticities are zero, milk production is not

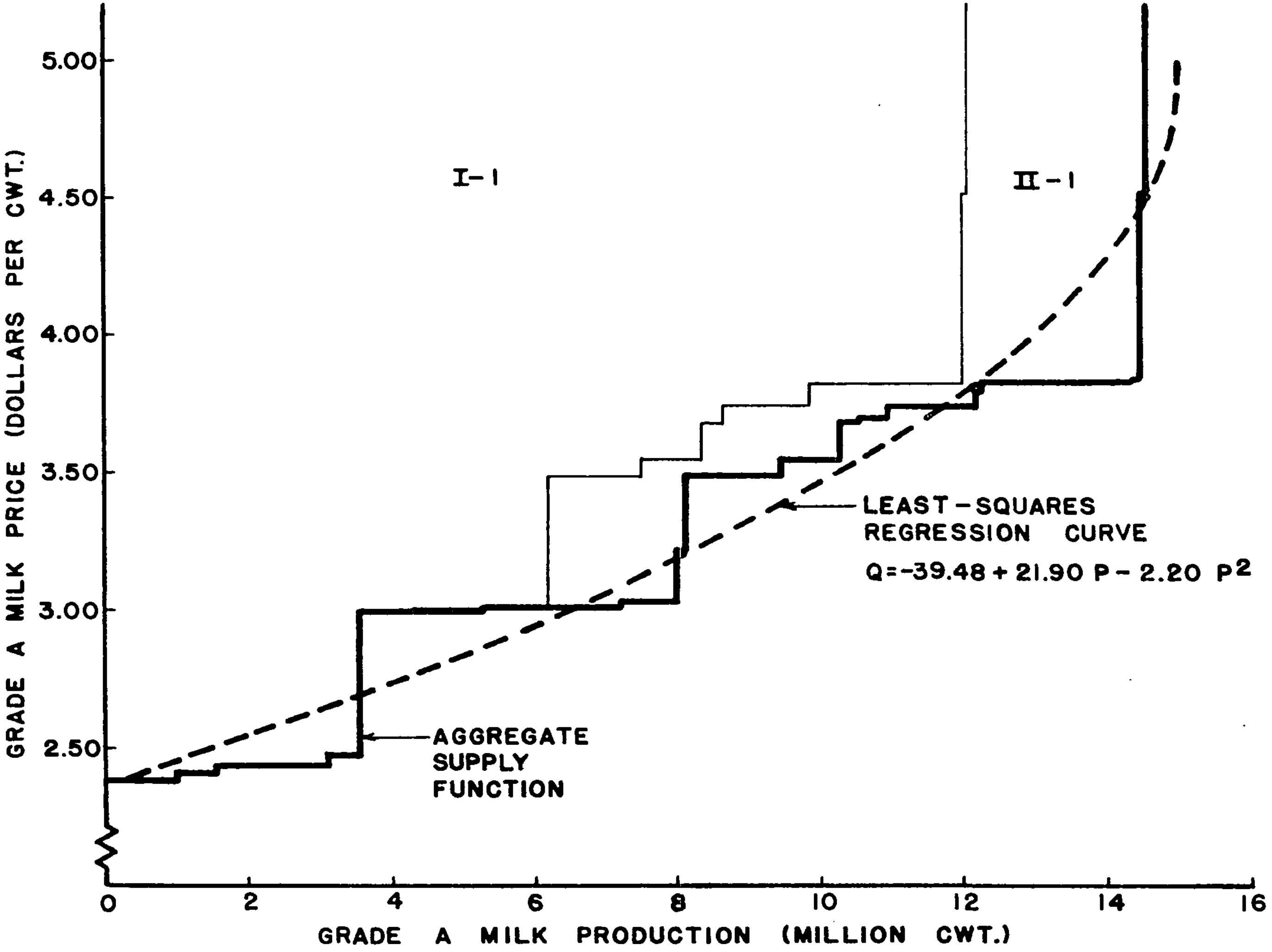


Figure 25. Aggregate stepped and smoothed supply function for grade A milk, showing the contribution of each type of farm, for hog prices $11.10 and $12.60 per cwt.

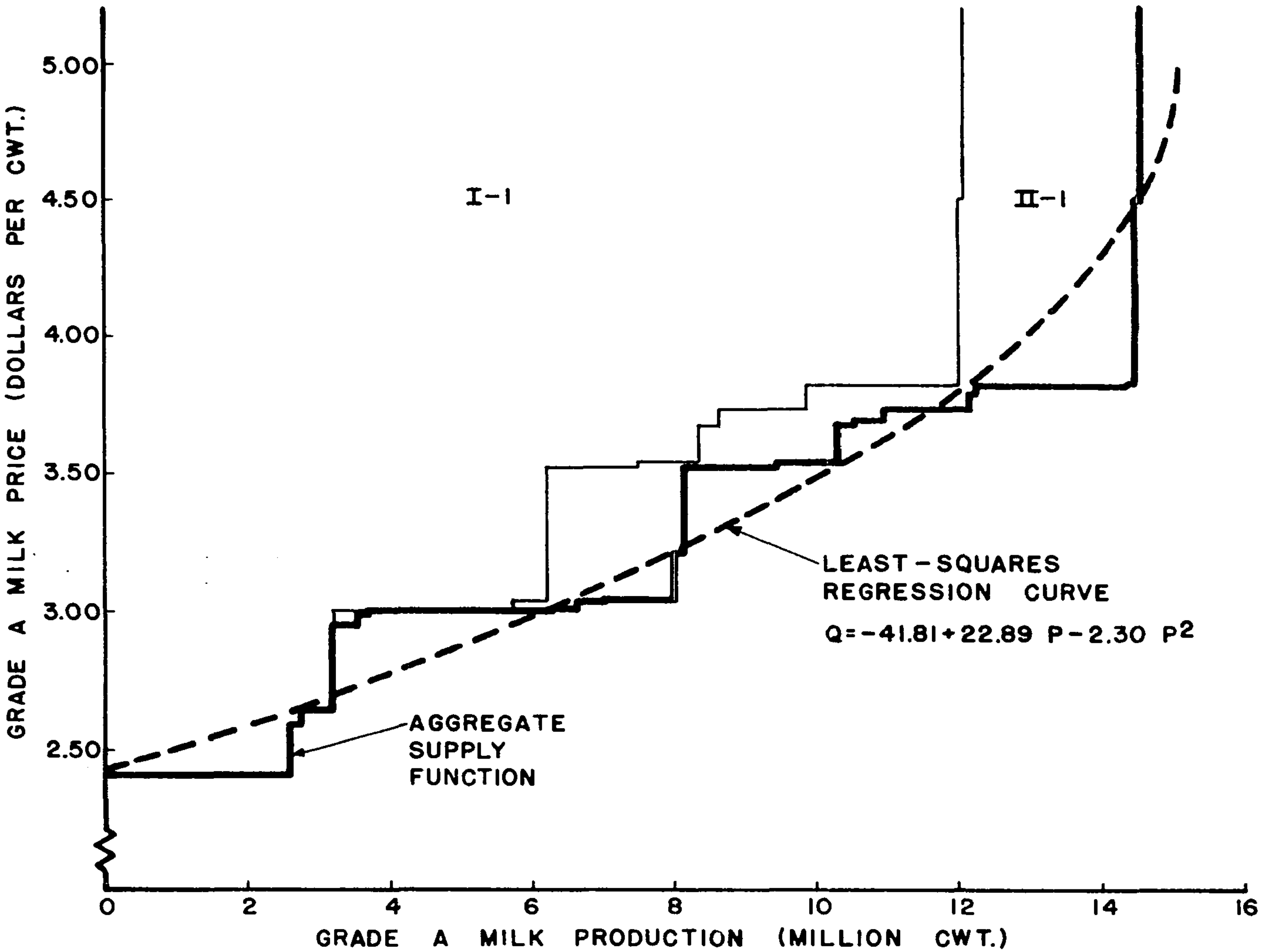


Figure 26. Aggregate stepped and smoothed supply function for grade A milk, showing the contribution to each type of farm, for hog price $14.10 per cwt.

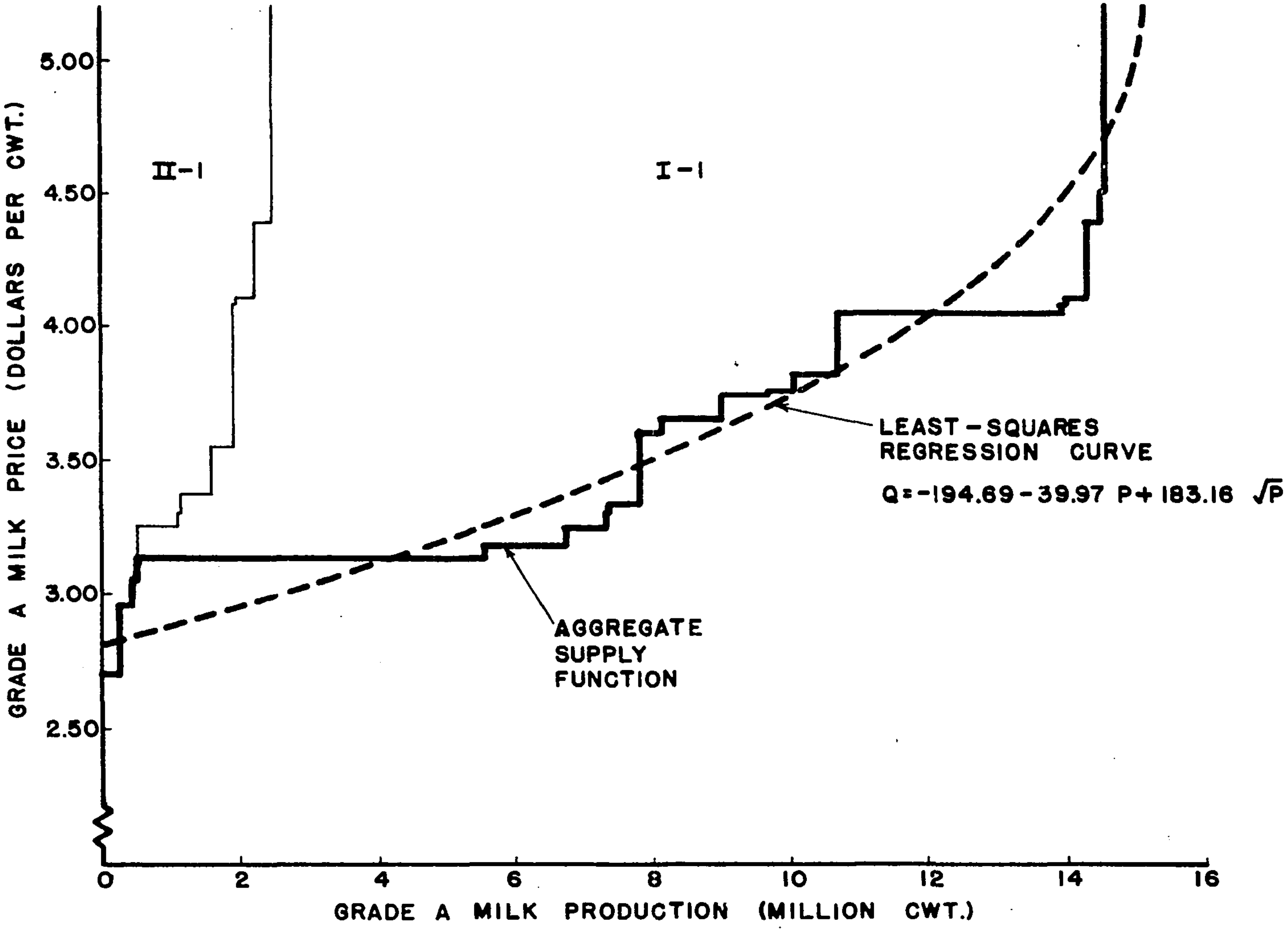


Figure 27. Aggregate stepped and smoothed supply function for grade A milk, showing the contribution from each type of farm, for hog price \$15.60 per cwt.

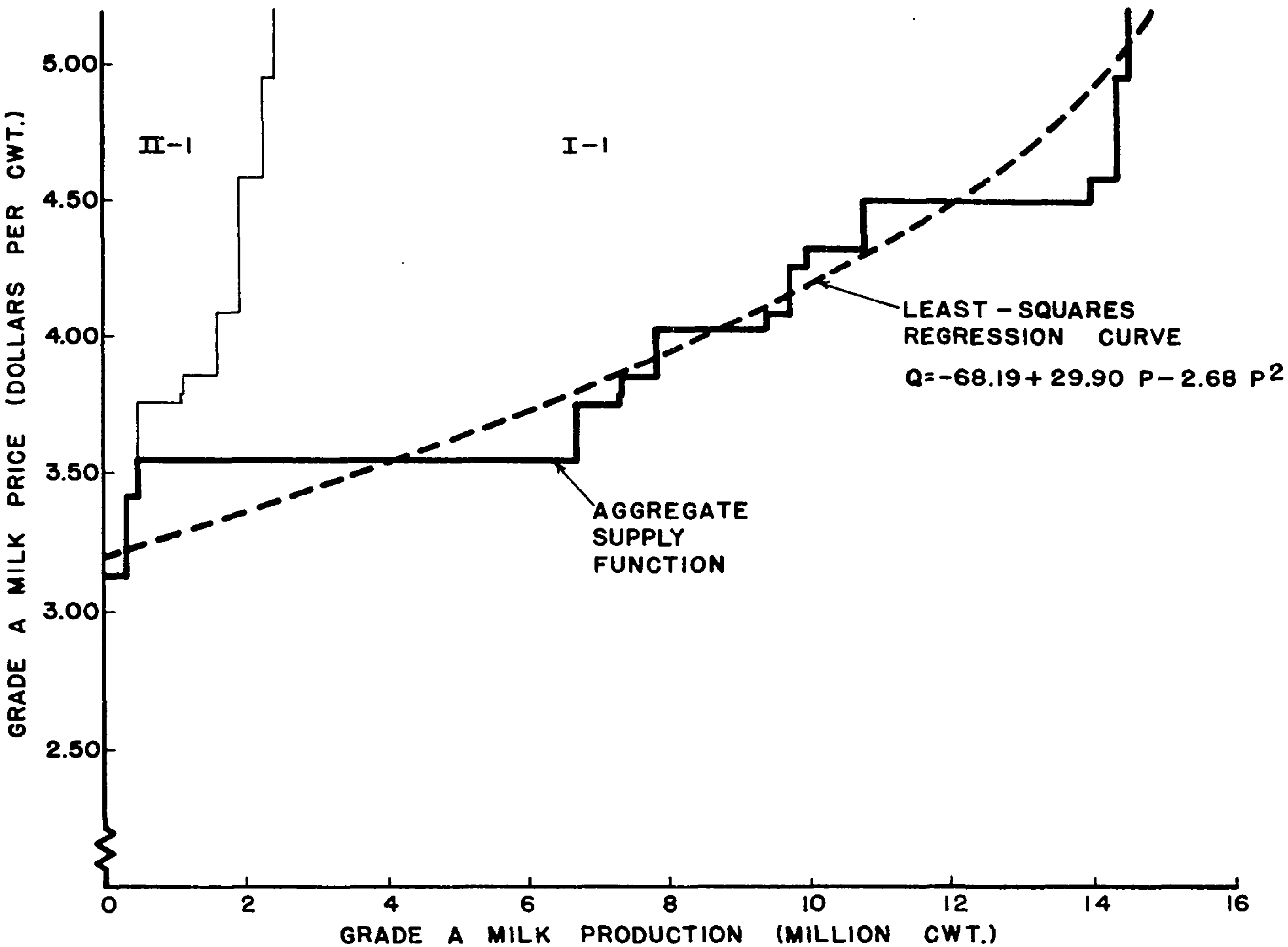


Figure 28. Aggregate stepped and smoothed supply function for grade A milk, showing the contribution from each type of farm, for hog price $17.10 per cwt.

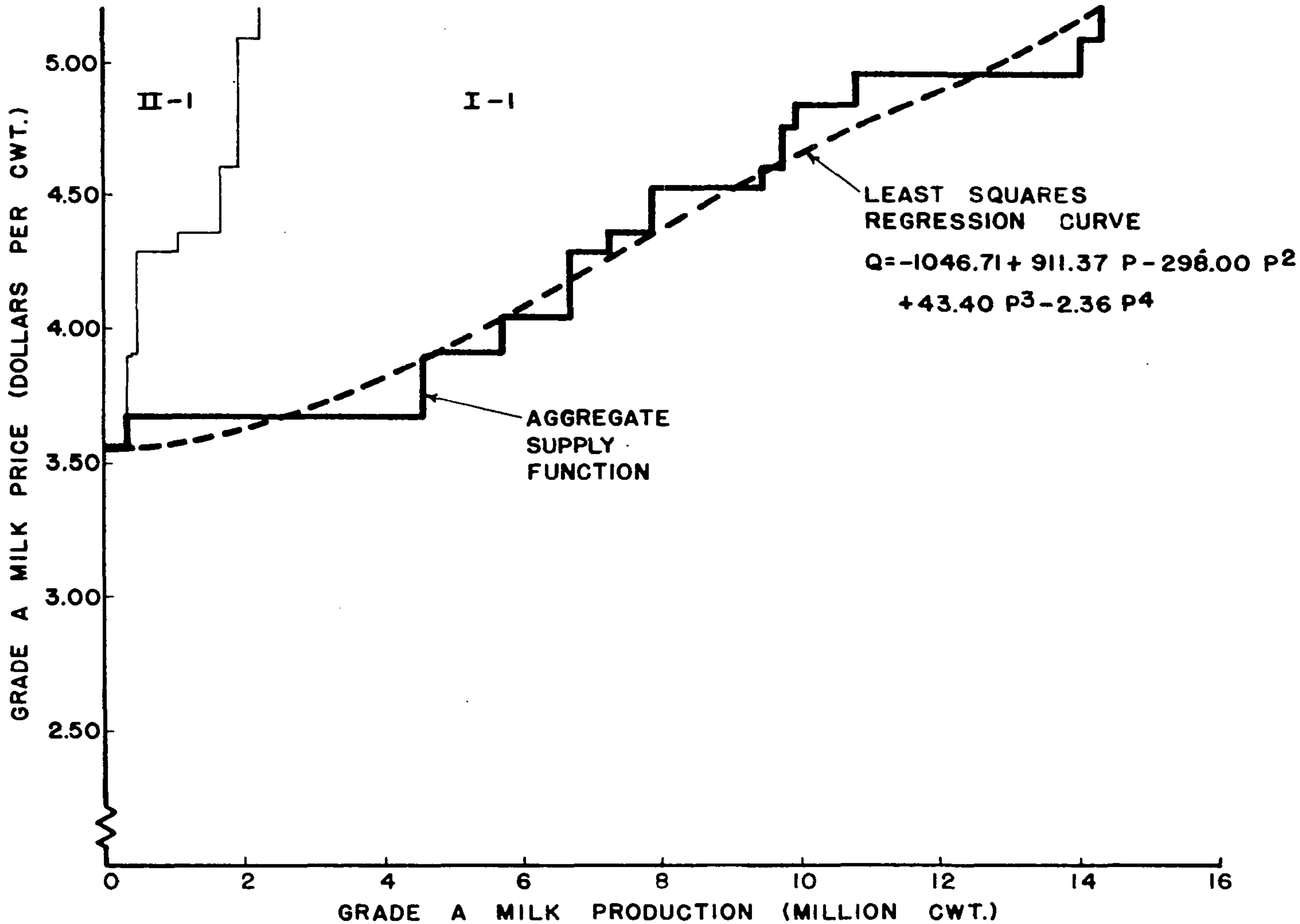


Figure 29. Aggregate stepped and smoothed supply function for grade A milk, showing the contribution from each type of farm, for hog price $18.60 per cwt.

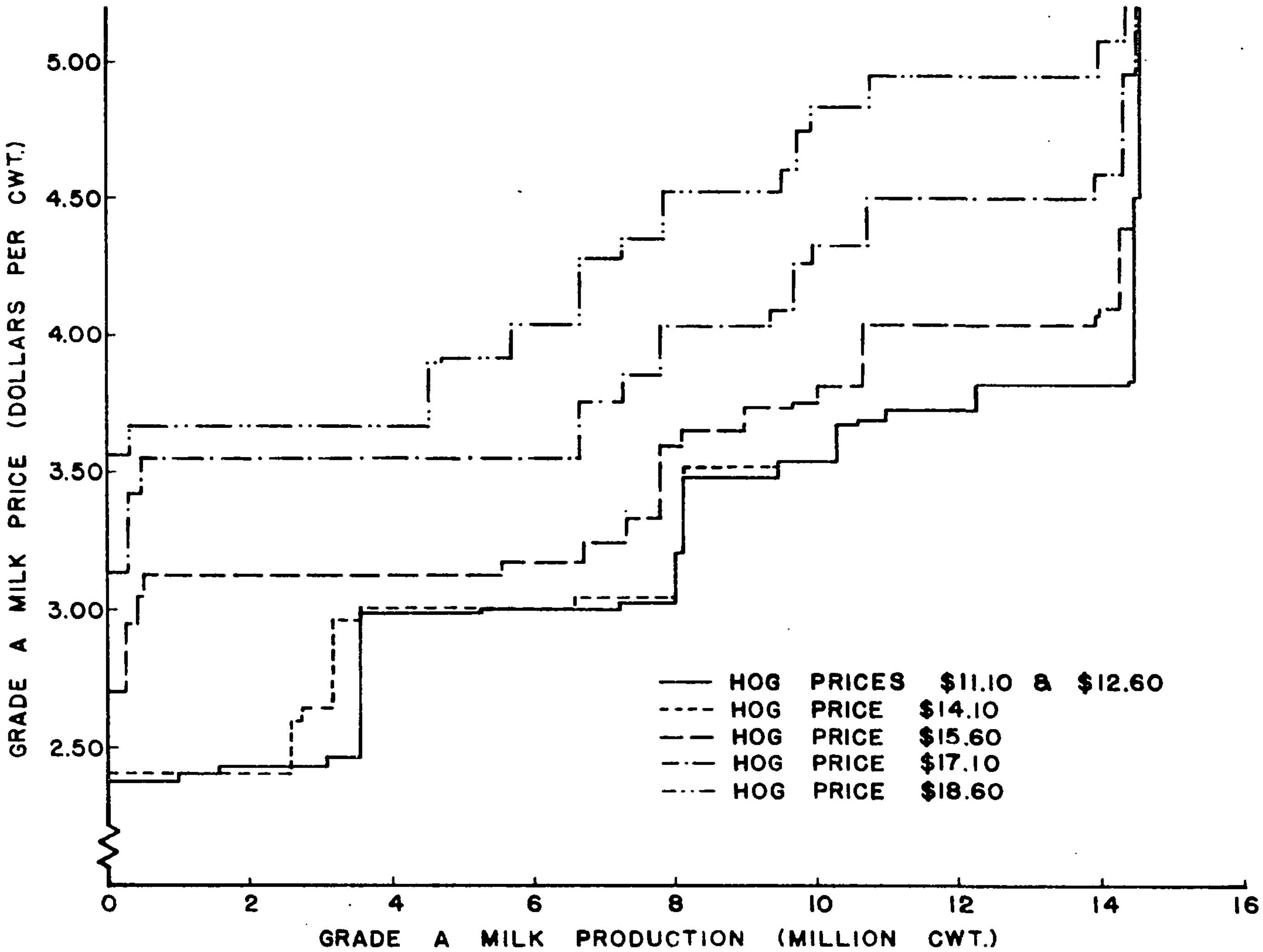


Figure 30. Aggregate stepped supply functions for grade A milk for each of six hog prices

Table 9. Supply elasticities at selected milk and hog prices from fitted regression curves of aggregate grade A milk supply[a]

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.40	2.80	3.20	3.60	4.00	4.40	4.80	5.20	R^2 from regression
11.10 or 12.60	66.87	5.84	3.10	2.02	1.33	0.78	0.25	-	0.96
14.10	-	6.65	3.34	2.12	1.40	0.82	0.26	-	0.95
15.60	-	405.23	7.07	3.29	1.96	1.15	0.59	0.07	0.95
17.10	-	-	16.38	8.07	3.98	2.41	1.48	0.70	0.95
18.60	-	-	-	304.22	52.10	38.05	12.85	10.82	0.95

[a]Elasticities computed by using the formula $E = \frac{dq}{dp} \cdot \frac{p}{q}$.

Figure 31. Aggregate production of grade A milk for various milk and hog prices

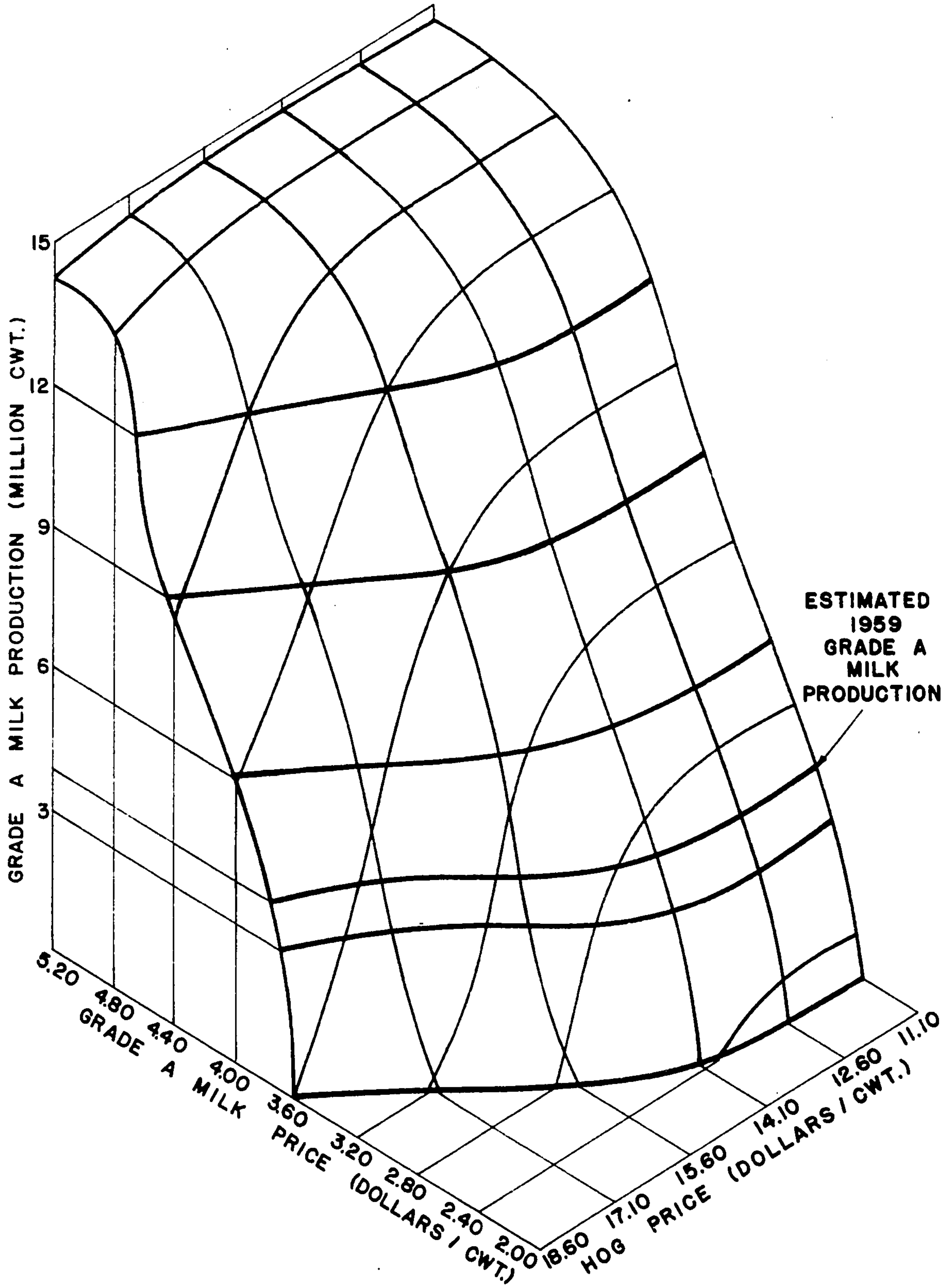

GRADE A MILK PRODUCTION (MILLION CWT.)
15
12
9
6
3
5.20
4.80
4.40
4.00
3.60
3.20
2.80
2.40
2.00
GRADE A MILK PRICE (DOLLARS / CWT.)
18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS / CWT.)
ESTIMATED
1959
GRADE A
MILK
PRODUCTION

Table 10. Aggregate grade A milk production from programming results by milk price, by hog price

Milk price (dollars per cwt.)	Hog price (dollars per cwt.) 11.10 million cwt.	12.60 million cwt.	14.10 million cwt.	15.60 million cwt.	17.10 million cwt.	18.60 million cwt.
2.00	0	0	0	0	0	0
2.40	1.00	1.00	0	0	0	0
2.80	3.56	3.56	3.20	0.27	0	0
3.20	8.03	8.03	8.03	6.70	0.31	0
3.60	10.26	10.26	10.26	8.12	6.70	0.31
4.00	14.49	14.49	14.49	10.65	7.81	5.70
4.40	14.49	14.49	14.49	14.49	10.76	7.87
4.80	14.56	14.56	14.50	14.56	14.36	9.91
5.20	14.56	14.56	14.56	14.56	14.51	14.31

Table 11. Cross-elasticities of supply at selected milk and hog prices for aggregate grade A milk production with respect to hog price[a]

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.40	2.80	3.20	3.60	4.00	4.40	4.80	5.20
11.10 to 12.60	0	-0	0	0	0	0	0	0
12.60 to 14.10	-17.80	-0.95	0	0	0	0	0	0
14.10 to 15.60	-	-16.66	-1.79	-2.31	-3.02	0	0	0
15.60 to 17.10	-	-21.80	-19.87	-2.09	-3.35	-3.22	-0.15	-0.04
17.10 to 18.60	-	-	-23.80	-21.70	-3.72	-3.69	-4.36	-0.17

[a]Arc elasticities computed by the formula: $E = \dfrac{q_1 - q_2}{p_1 - p_2} \cdot \dfrac{p_1 + p_2}{q_1 + q_2}$.

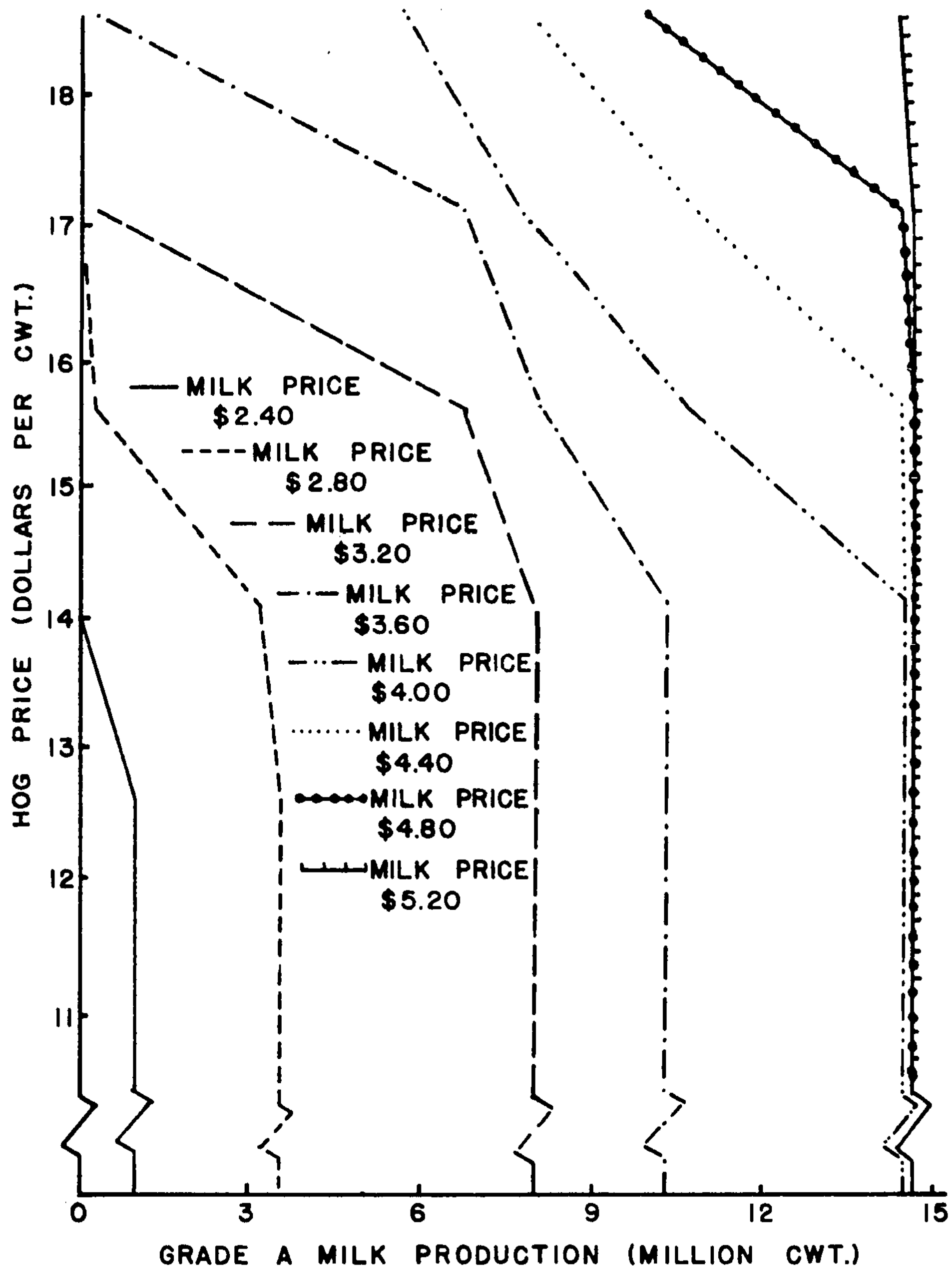


Figure 32. The relationship of aggregate grade A milk production to the price of hogs

affected by hog price because hogs are not sufficiently profitable to be competitive with grade A dairying for farm resources. For prices in the range of the projected 1965 prices and for prices which have occurred recently, cross-elasticities of zero to -3.35 were obtained. This indicates that optimally, a one percent change in hog price should change grade A milk production by up to 3.35 percent. Of course, the price change would have to be considered permanent, since production of milk eligible for fluid consumption cannot be begun or stopped, or increased and decreased on short notice.

Supply functions and cross-supply functions for hogs

The supply functions for hogs are not stepped functions, since exact border prices in the optimum plans were not determined for hogs. The optimum quantities of hogs were only determined for six discrete hog prices. The minimum hog price at which any hog production would be profitable was also determined. The points where both prices and quantities are known have been connected. These aggregate supply functions and the contribution of each type of farm to the aggregate are shown for each of six milk price levels in figures 33 to 38. Fitted regression lines for the aggregate functions are also shown on these figures. Hog production from farms capable of producing grade B milk was combined with hog production from grade A farms with the assumption that the milk price difference of approximately $1.00 per cwt. will continue. Both grade B and grade A milk prices are listed for the six levels of milk prices for which hog supply functions have been derived. The aggregate functions are all shown together in figure 39 for comparison. Most of these hog supply functions

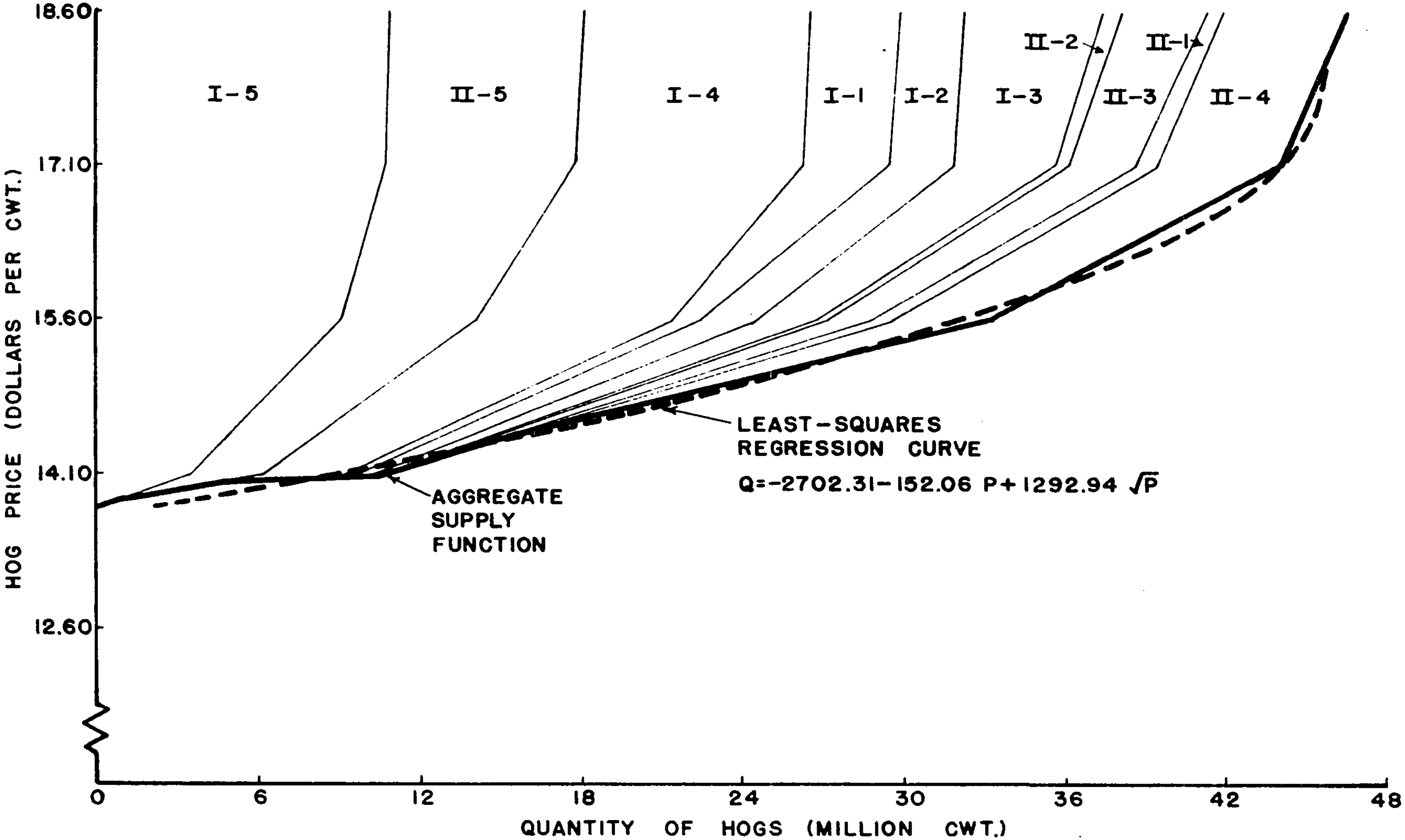


Figure 33. Aggregate supply function for hogs, showing the contribution of each type of farm, for grade B milk price $2.20 and grade A milk price $3.20

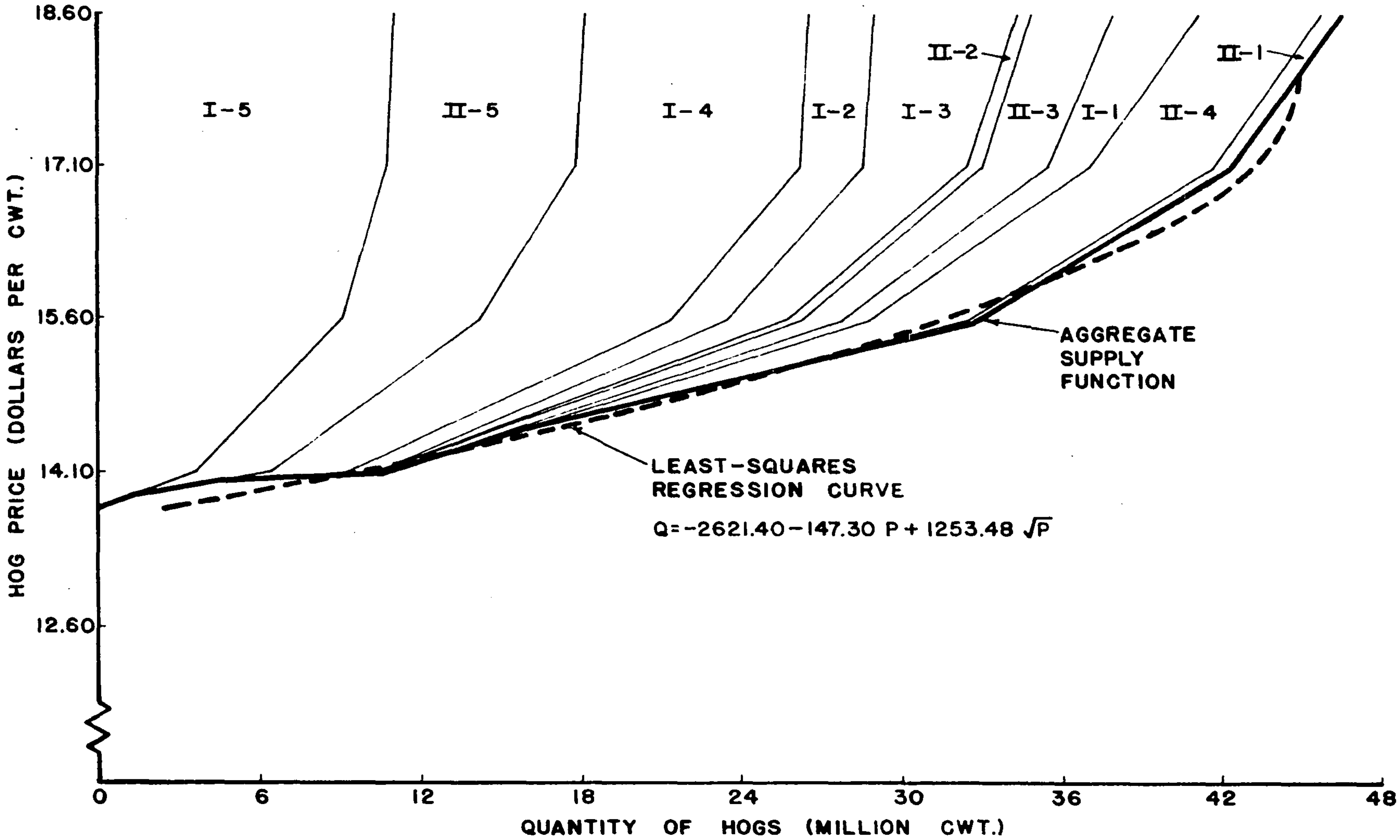


Figure 34. Aggregate supply function for hogs, showing the contribution of each type of farm, for grade B milk price $2.60 and grade A milk price $3.60

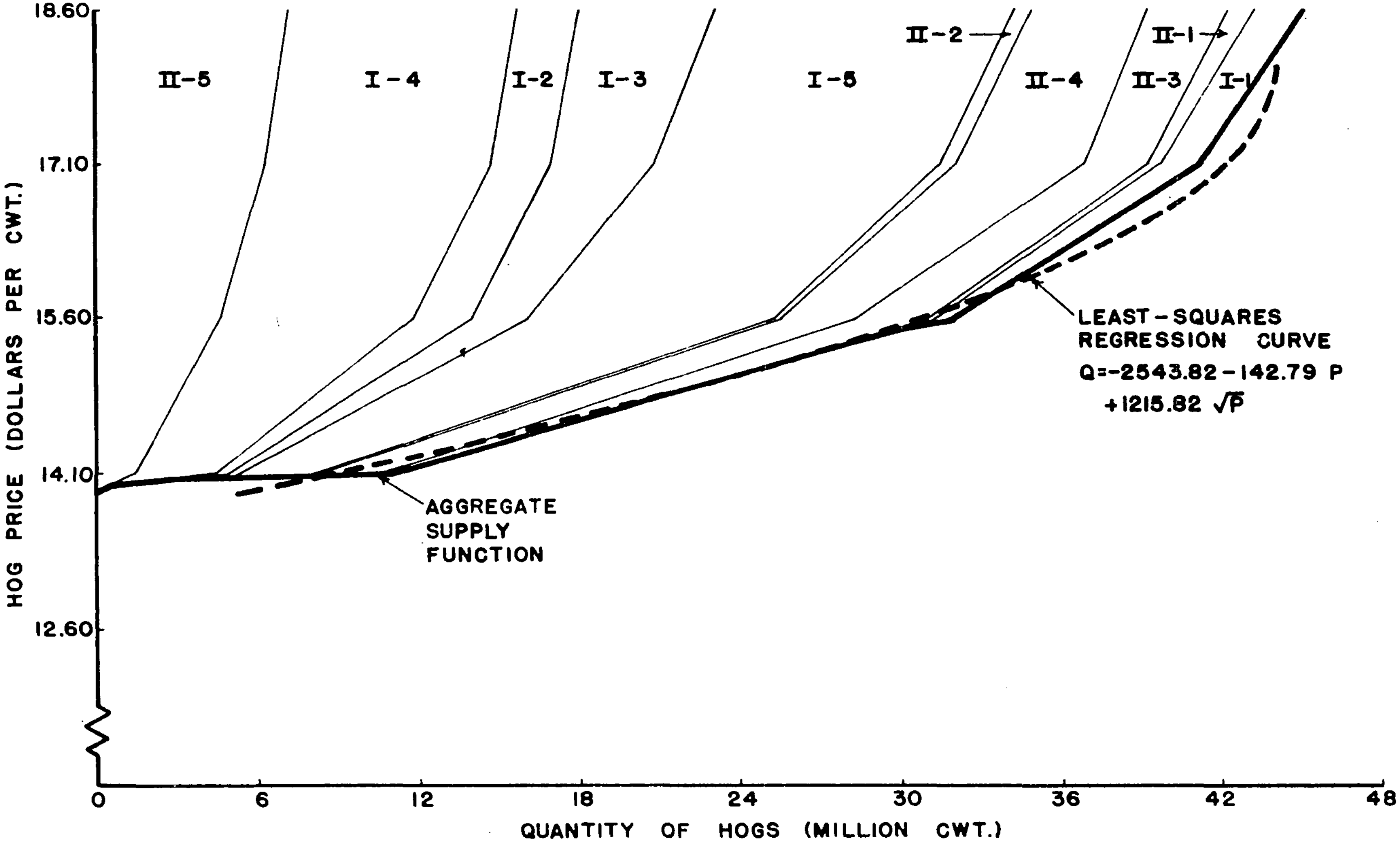


Figure 35. Aggregate supply function for hogs, showing the contribution of each type of farm, for grade B milk price \$3.00 and grade A milk price \$4.00

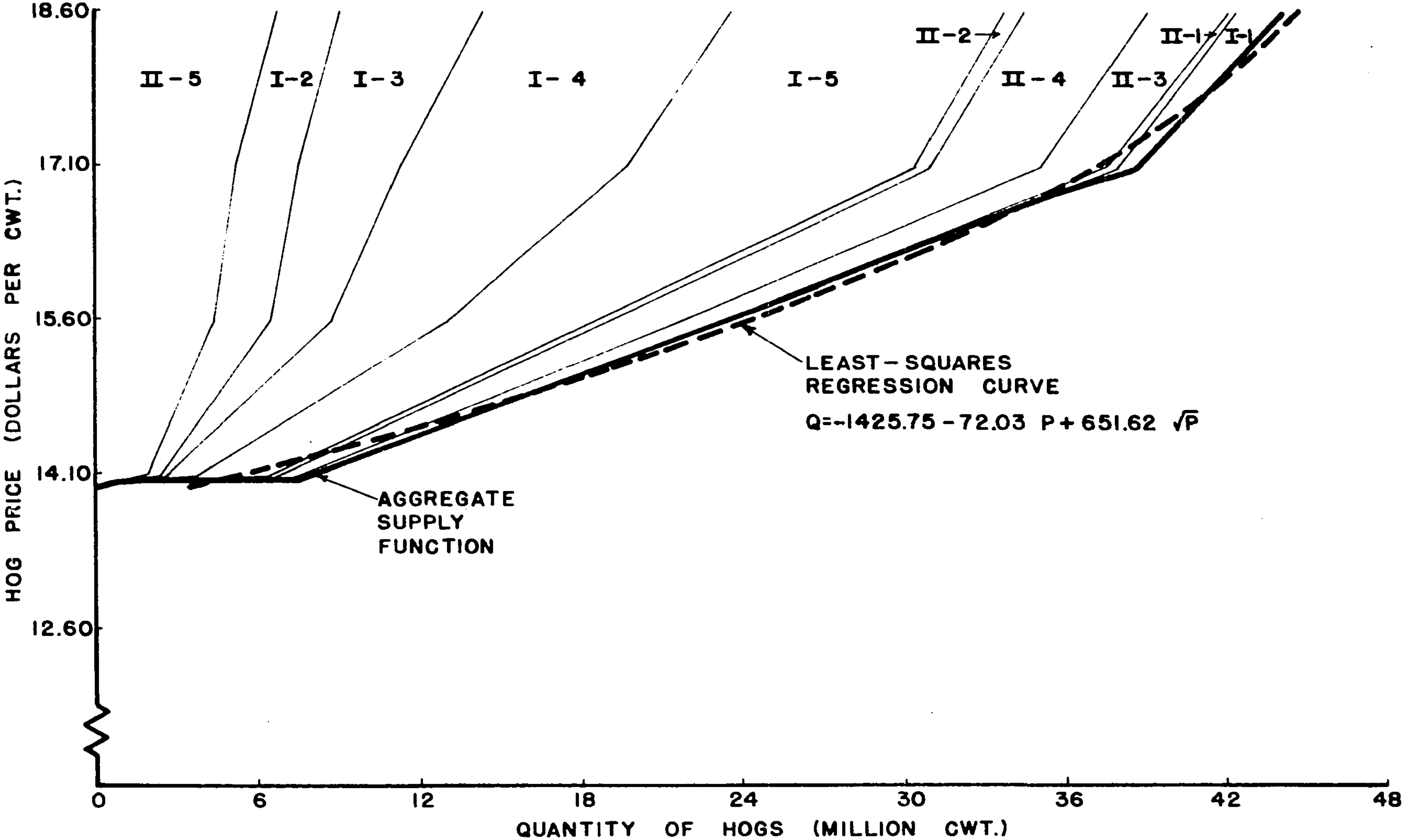


Figure 36. Aggregate supply function for hogs, showing the contribution of each type of farm, for grade B milk price $3.40 and grade A milk price $4.40

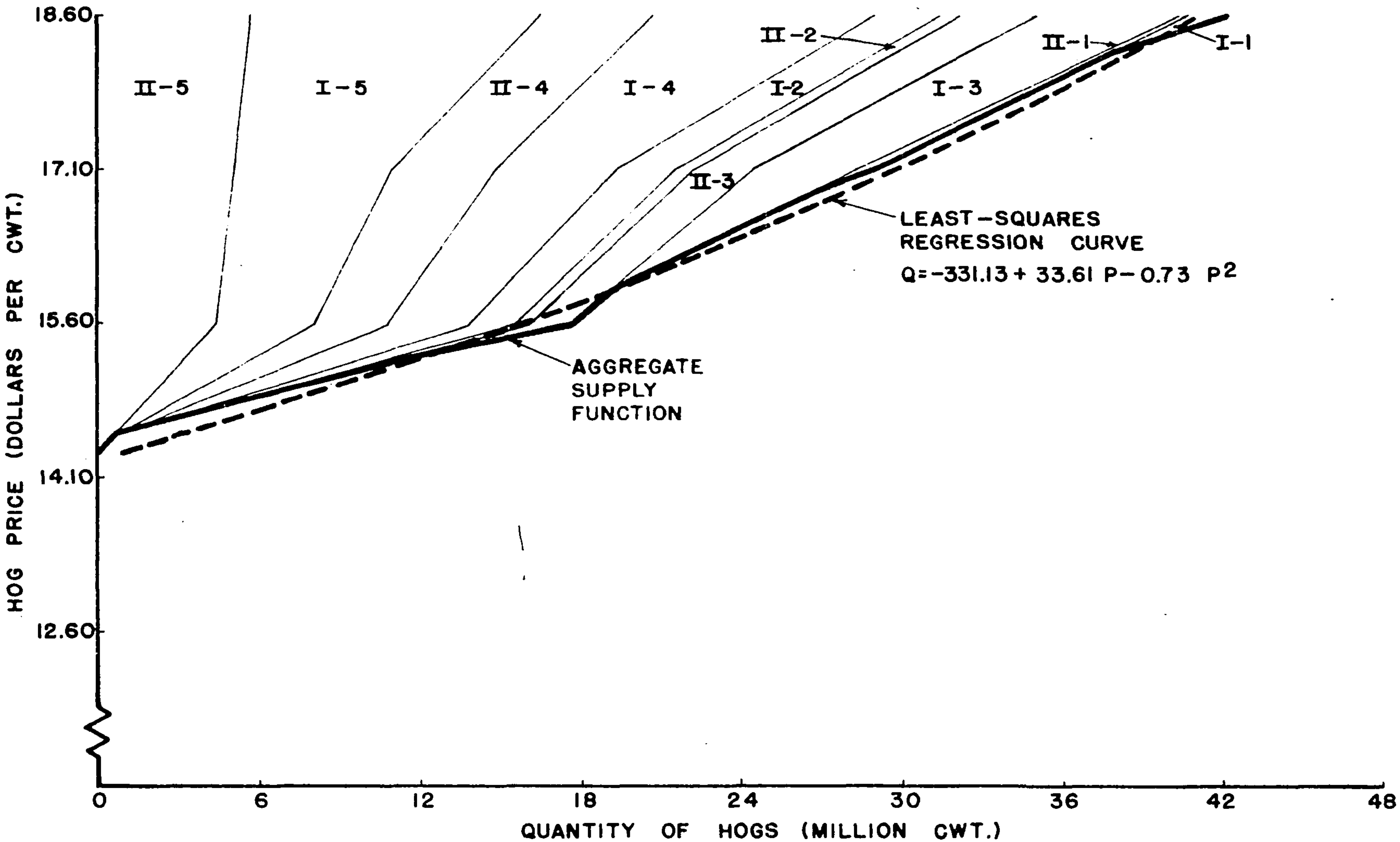


Figure 37. Aggregate supply function for hogs, showing the contribution of each type of farm, for grade B milk price \$3.80 and grade A milk price \$4.80

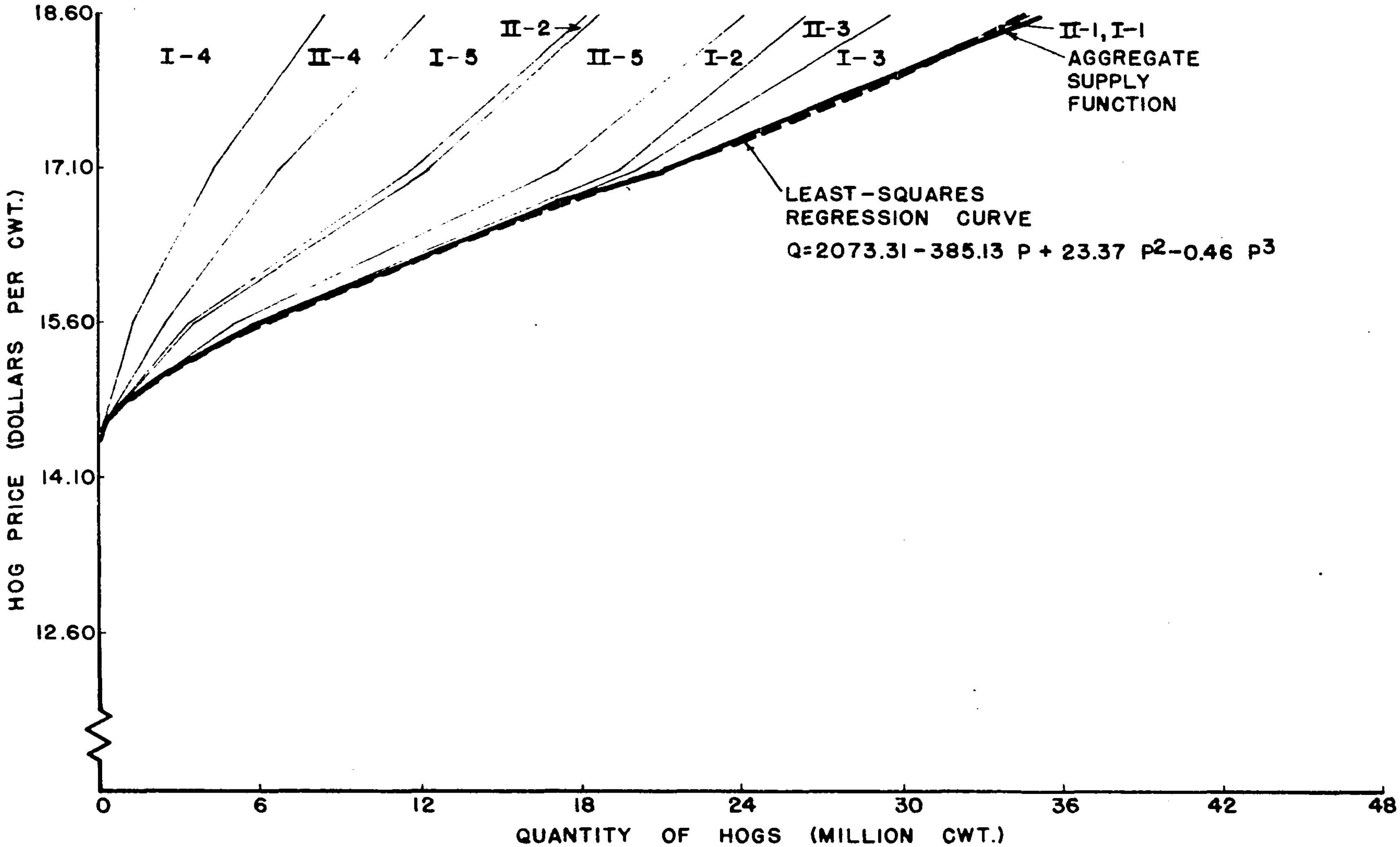


Figure 38. Aggregate supply function for hogs, showing the contribution of each type of farm, for grade B milk price $4.20 and grade A milk price $5.20

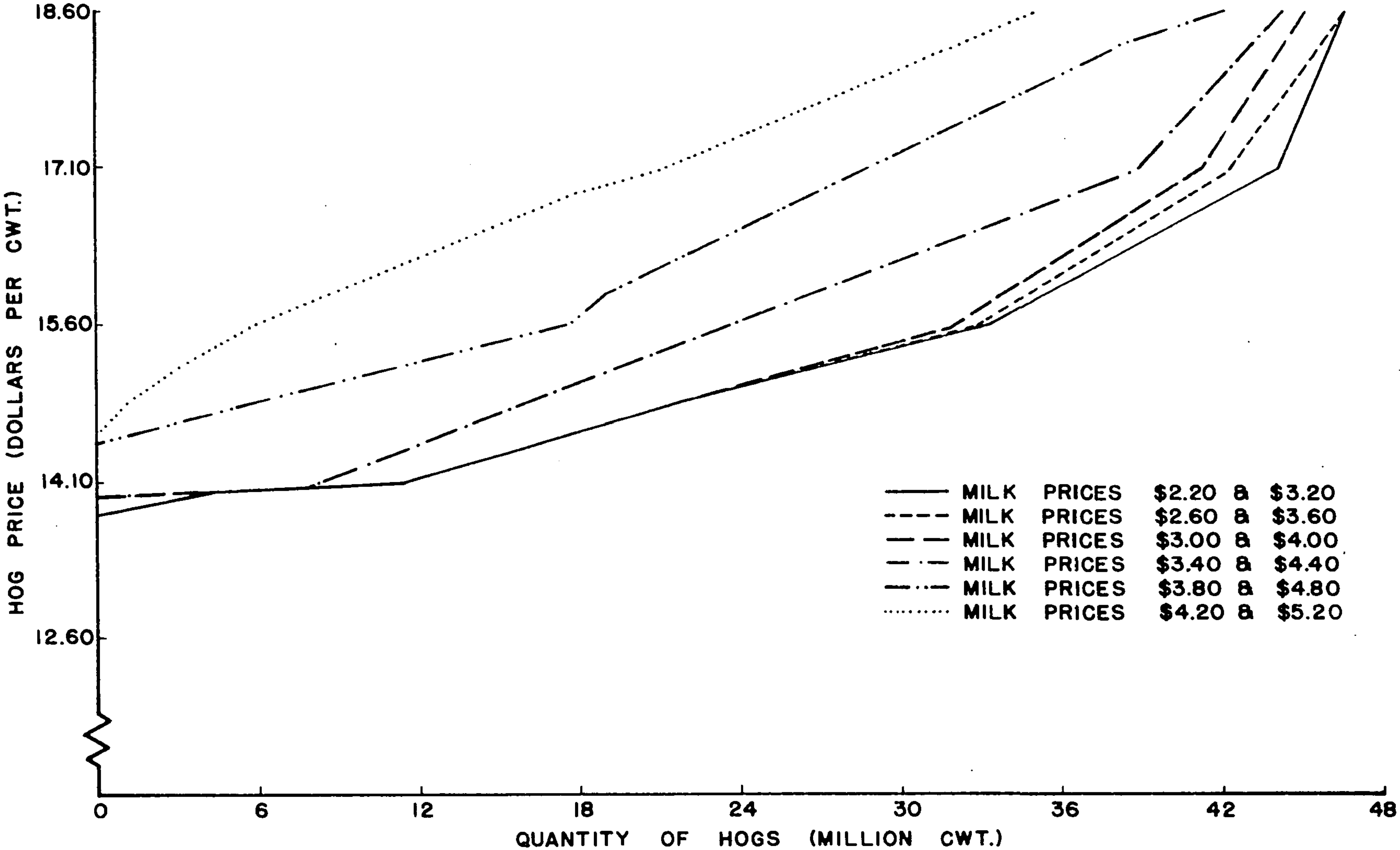


Figure 39. Aggregate supply functions for hogs for each of six sets of milk prices

have the characteristic of continuously increasing slope as hog prices are increased. The hog supply functions for high levels of milk prices do not all follow this pattern, however. In these cases, hog production is excluded until rather high hog prices are reached, then plans include substantial hog production. For the most part, optimal plans for dairy farms include hog production at slightly lower prices than is the case on non-dairy farms. Dairy farms also contribute more to the total supply than other types of farms, mainly because there are more of them.

The supply elasticities shown in table 12 are higher than those obtained in a statistical analysis by Dean and Heady (12), where they obtained estimates of supply elasticity for hogs of from 0.28 to 0.74. The same comments made in reference to comparing elasticities from normative to those from statistical supply functions for milk, apply here. One estimate is not right and the other wrong. The elasticities depend on the assumptions and characteristics of each type of estimate.

A production surface, relating optimum aggregate levels of hog production to milk and hog prices is shown in figure 40. This same general data is in tabular form in table 13. Figure 40 as well as the figures 33 to 38 show that the optimal level of hog production is very responsive to hog price. Also figure 40 as well as figure 41 and table 14 shows that the cross-elasticity of hog production with respect to milk price would be very high if optimum adjustments were made. Cross-elasticities for hog production with respect to milk price are high in ranges of milk price where milk production is profitable. Zero cross-elasticities are bound at milk prices where milk production is unprofitable and not

Table 12. Supply elasticities at selected milk and hog prices from fitted regression curves of aggregate hog supply[a]

Grade B and grade A milk price (dollars per cwt.)	Hog price (dollars per cwt.) 14.10	15.60	17.10	18.60	R^2 from regression
2.20 & 3.20	33.18	5.81	0.93	-	0.99
2.60 & 3.60	32.60	5.77	0.92	-	0.99
3.00 & 4.00	32.85	5.77	1.62	-	0.98
3.40 & 4.40	38.15	6.84	3.08	1.52	0.99
3.80 & 4.80	-	11.67	5.14	2.80	0.99
4.20 & 5.20	-	17.30	8.76	3.72	0.99

[a]Elasticities computed by using the formula $E = \frac{dq}{dp} \cdot \frac{p}{q}$.

Figure 40. Aggregate production of hogs for various prices for milk and hogs

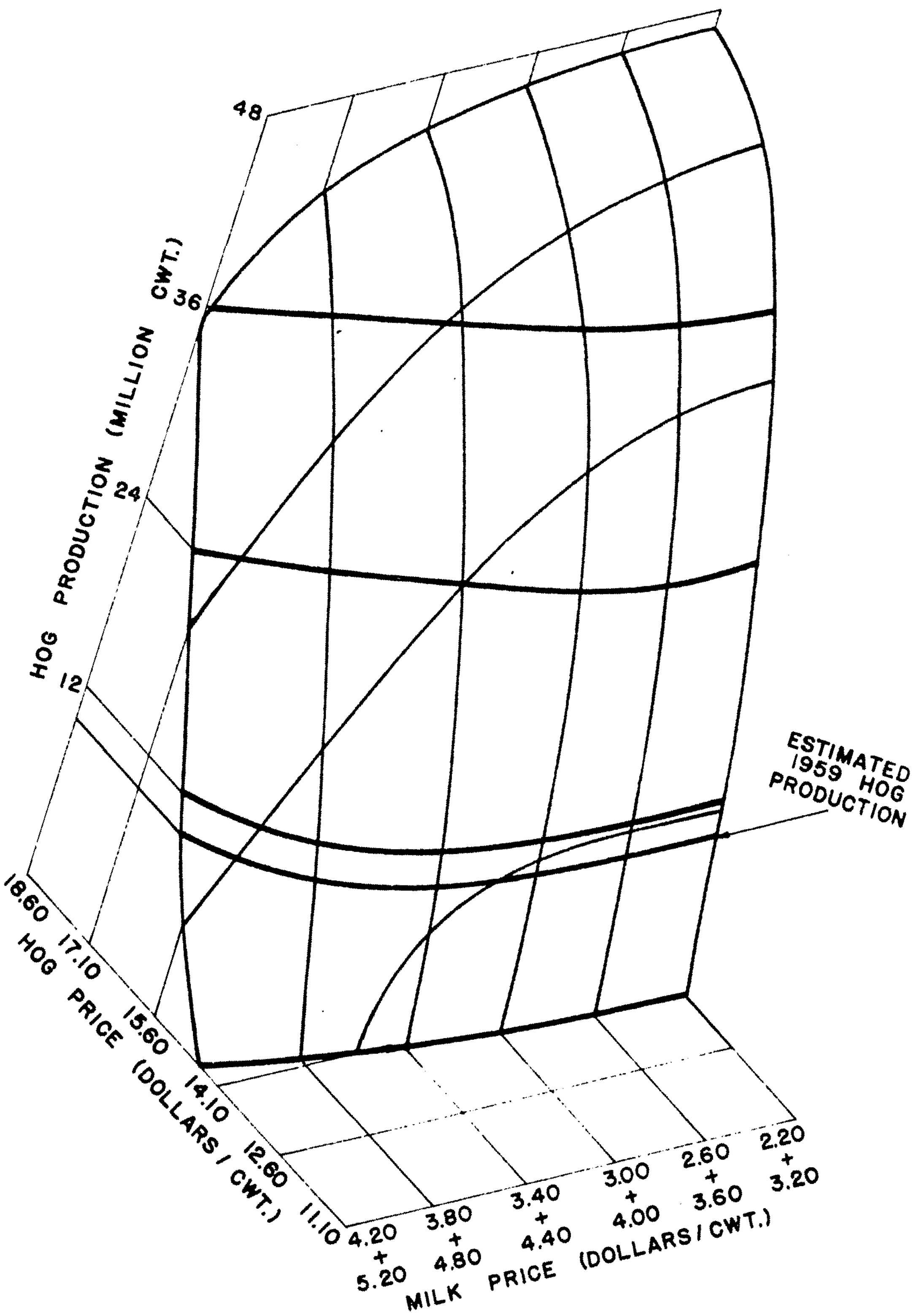

48
36
24
12
HOG PRODUCTION (MILLION CWT.)
ESTIMATED 1959 HOG PRODUCTION
18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS / CWT.)
4.20 + 5.20
3.80 + 4.80
3.40 + 4.40
3.00 + 4.00
2.60 + 3.60
2.20 + 3.20
MILK PRICE (DOLLARS / CWT.)

Table 13. Aggregate hog production from programming results, by milk price, by hog price

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.20 and 3.20	2.60 and 3.60	3.00 and 4.00	3.00 and 4.40	3.80 and 4.80	4.20 and 5.20
	million cwt.	million cwt.	million cwt.	million cwt.	million cwt.	million cwt.
11.10	0	0	0	0	0	0
12.60	0	0	0	0	0	0
14.10	10.88	10.44	10.91	7.87	0	0
15.60	33.28	32.83	32.02	23.40	17.90	5.92
17.10	44.03	42.38	41.29	38.75	28.66	21.34
18.60	46.60	46.56	45.24	44.10	42.25	35.02

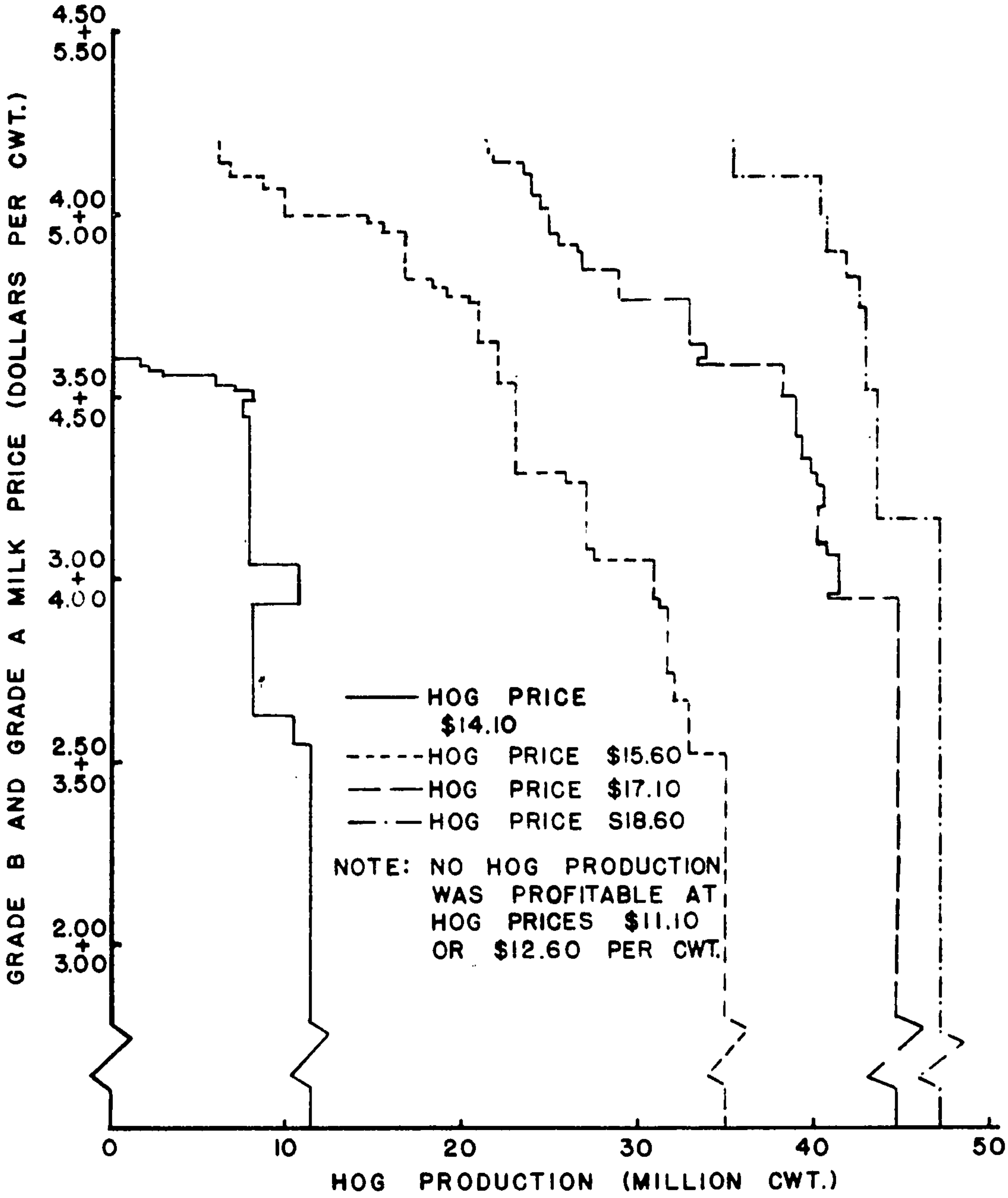


Figure 41. The relationship of aggregate hog production to price of milk

Table 14. Cross-elasticities of supply at selected milk and hog prices for aggregate hog production with respect to milk prices[a]

Milk price (dollars per cwt.)	Hog price (dollars per cwt.) 14.10	15.60	17.10	18.60
2.20	-0.26	-0.20	0	0
2.60	-0.78	-0.52	-0.16	-0.06
3.00	-2.11	-1.10	-0.63	-0.18
3.40	-6.31	-2.04	-1.92	-0.44
3.80	-	-5.30	-2.74	-1.04
4.20	-	-33.09	-7.00	-2.95

[a]Arc elasticities computed by formula $E = \frac{\Delta q}{\Delta p} \cdot \frac{p}{q}$ using only grade B milk prices and sight estimated slopes from figure 41 at each milk price given. Production of hogs on grade A dairy farms is included here, but grade A milk was priced $1.00 per cwt. higher.

competitive for resources used in pork production. Small areas of complimentary production (positive slopes on the cross-supply functions) in figure 41 were eliminated in the hand-smoothing process used for computing elasticities. Therefore, there are no positive cross-elasticities in table 14.

The estimated 1959 pork production for northeastern Iowa was computed from data given in Kolmer (30) and the Supplement for 1960 to Livestock & Meat Statistics (64, p. 34). The actual production of hogs in 1959 was somewhat higher than the 1959 prices ($13.80 for hogs, $3.04 for grade B milk) would have dictated under optimum adjustments. However, the hog price in 1959 was somewhat lower than usual. Expectations were probably for higher hog prices.

Cross-supply Functions for Beef

Price changes for milk and hogs affect the optimum levels of beef production substantially. In general, low prices for milk and hogs makes cattle-feeding profitable at levels of 10 to 12 times the present production for the beef prices used in this study. But, high prices for milk or for hogs, or both, divert resources from cattle-feeding to dairying or hog production or some combination of dairying, hog-raising and cattle feeding. A production surface, which is hand fitted, relating beef production to milk and hog prices in the optimum plans is shown in figure 42. The estimated level of production of fed beef in 1959 is shown as a contour on this surface. The estimate of 1959 production was calculated from data presented by Kolmer (29). A tabular summary of the relationship between beef production and milk and hog prices is shown in table 15.

Cross-elasticities of supply for beef with respect to both hog and milk prices are quite high where either milk or hog prices are high enough for these products to compete with beef for farm resources. Cross-supply schedules are shown in figures 43 and 44. For very low hog prices a change in the hog price does not alter the optimum quantity of either hogs or beef. Therefore, both the elasticity of supply and cross-elasticity of supply are zero. The cross-elasticities for beef with respect to hog price are shown in table 16. They range from -23.00 to zero, except for

Figure 42. Aggregate beef production for various prices for milk and hogs

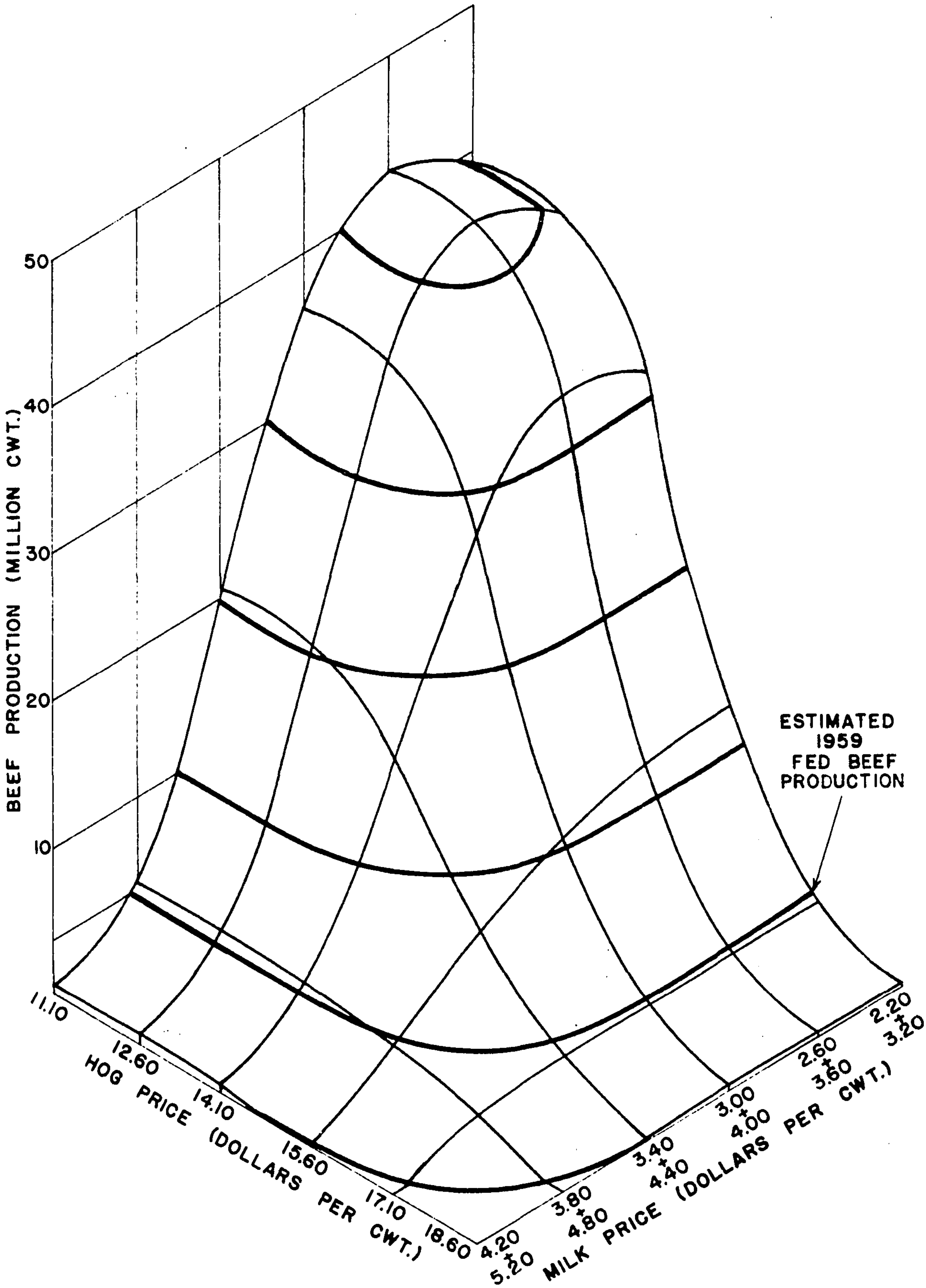

50
40
30
20
10
BEEF PRODUCTION (MILLION CWT.)
ESTIMATED
1959
FED BEEF
PRODUCTION
11.10
12.60
14.10
15.60
17.10
18.60
HOG PRICE (DOLLARS PER CWT.)
4.20 + 5.20
3.80 + 4.80
3.40 + 4.40
3.00 + 4.00
2.60 + 3.60
2.20 + 3.20
MILK PRICE (DOLLARS PER CWT.)

Table 15. Aggregate beef production from farm programming results, by milk price, by hog price

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.20 and 3.20	2.60 and 3.60	3.00 and 4.00	3.40 and 4.40	3.80 and 4.80	4.20 and 5.20
	million cwt.	million cwt.	million cwt.	million cwt.	million cwt.	million cwt.
11.10	36.76	41.89	36.90	29.11	3.30	0.47
12.60	36.76	41.89	36.90	29.11	3.30	0.47
14.10	29.33	33.11	26.71	20.22	3.30	0.47
15.60	12.34	11.37	10.24	7.20	1.81	.00
17.10	2.73	2.73	2.66	2.61	2.61	.05
18.60	0.15	0.15	0.15	0.09	0.03	0.03

two cases where the cross-elasticity is positive. These positive values are brought about by hog price going high enough to crowd out dairying because of competition for grain and labor on a particular farm type, but beef feeder-calves become profitable at the higher hog price because of the available forage and the different distribution of labor use. Cross-elasticities for beef with respect to milk price are shown in table 17. At high prices for hogs, a change in milk price has no effect on the optimal quantities of beef. In the middle, or most likely ranges of prices for the future, cross-elasticities range from zero to -7.89. For the most part, beef and hogs compete closely for resources so that the

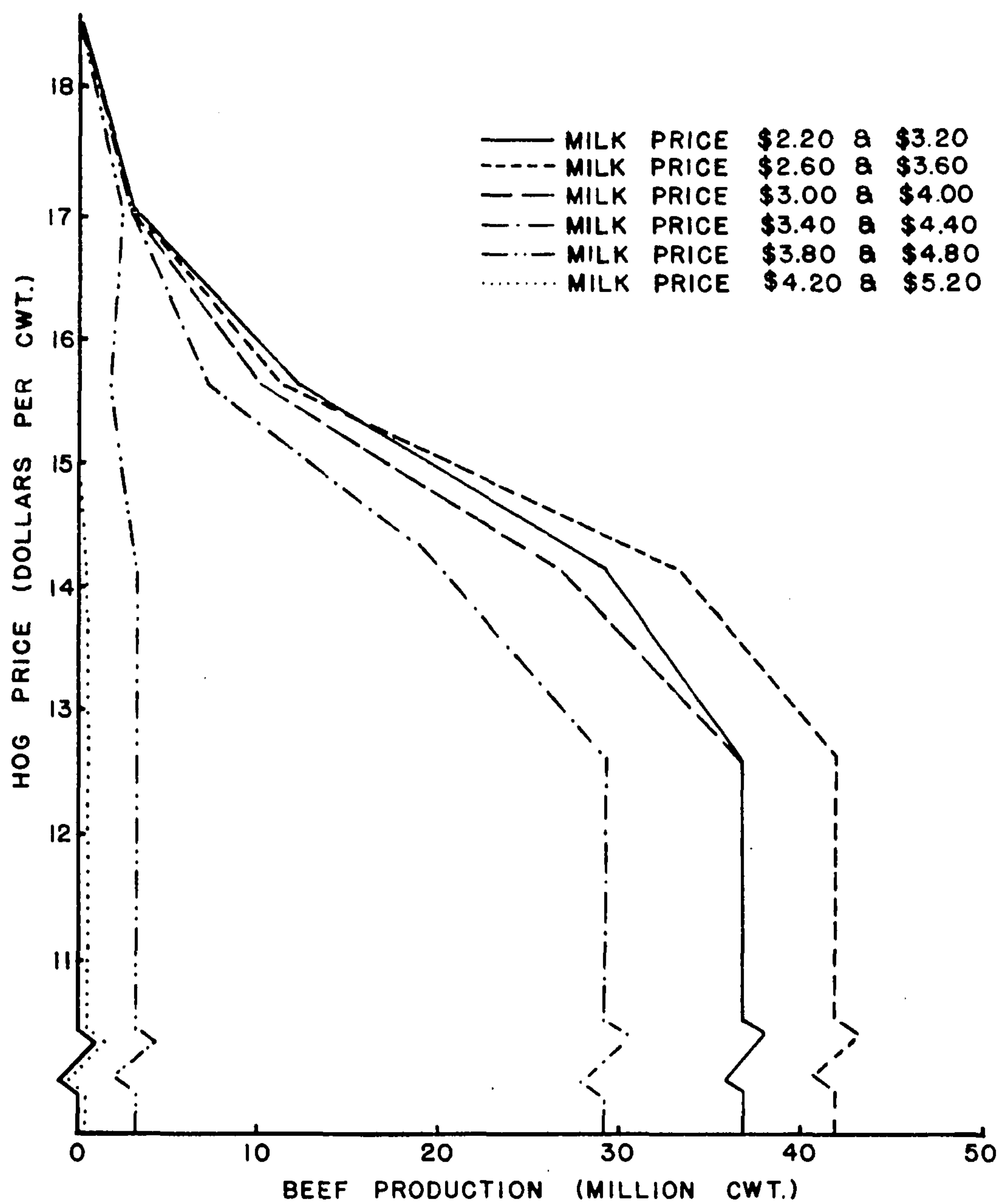


Figure 43. The relationship between aggregate beef production and hog prices

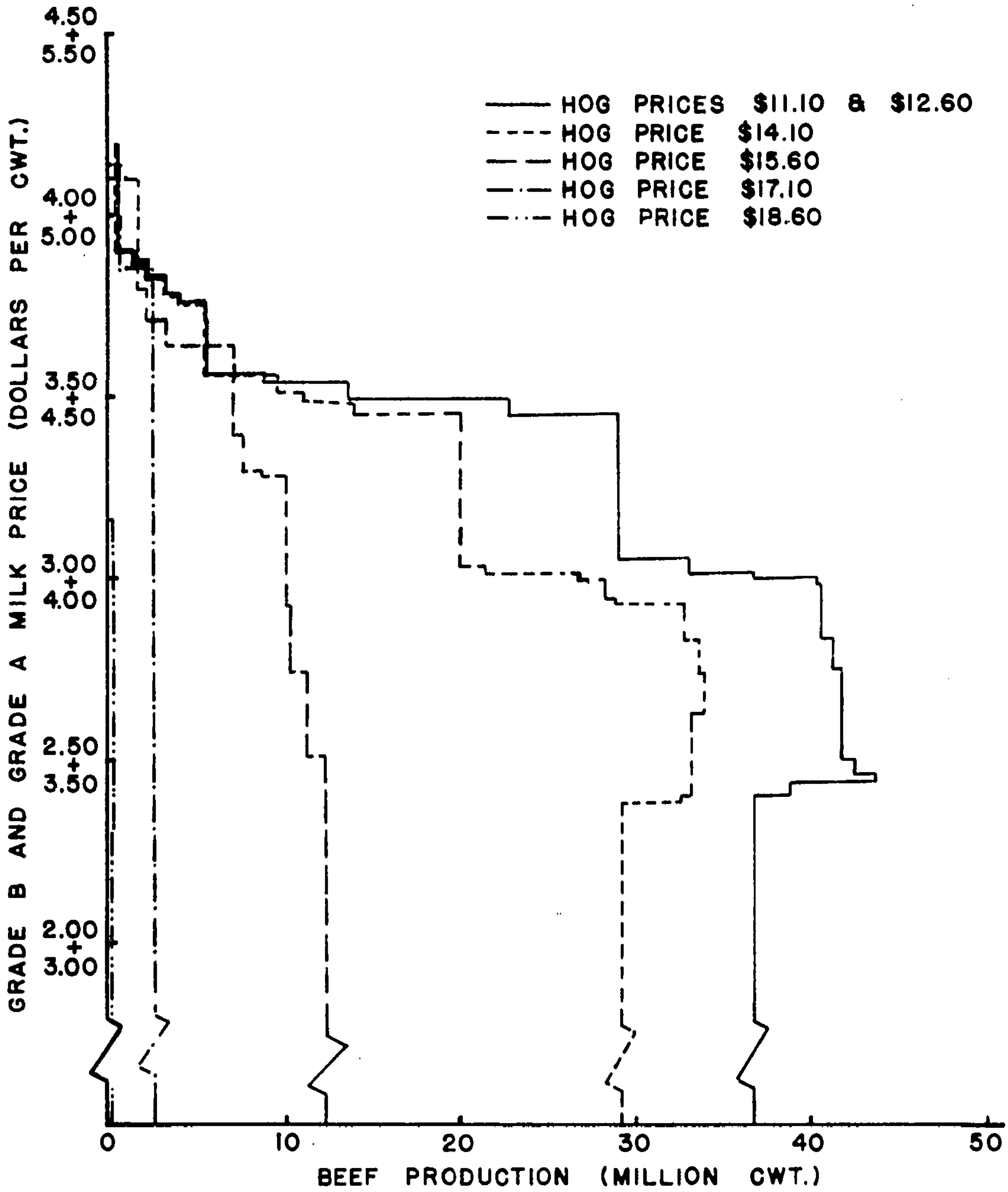


Figure 44. The relationship between aggregate beef production and milk prices

Table 16. Cross-elasticities of supply at selected milk and hog prices for aggregate beef production with respect to hog prices[a]

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.20 and 3.20	2.60 and 3.60	3.00 and 4.00	3.40 and 4.40	3.80 and 4.80	4.20 and 5.20
11.10 to 12.60	0	0	0	0	0	0
12.60 to 14.10	-2.00	-2.08	-2.85	-3.21	0	0
14.10 to 15.60	-8.07	-9.68	-8.83	-9.40	-5.77	-19.80
15.60 to 17.10	-13.90	-13.36	-12.81	-10.20	+3.95	+21.80
17.10 to 18.60	-21.32	-21.32	-21.26	-22.21	-23.26	-5.95

[a]Arc elasticities computed by the formula: $E = \frac{q_1 - q_2}{p_1 - p_2} \cdot \frac{p_1 + p_2}{q_1 + q_2}$.

cross-elasticities are very high. Also, as hog prices are increased the cross-elasticities of beef production with respect to hog price increase. This indicates that as hog prices go up there is increasing cause for resources to be diverted from beef production to hogs.

Most of the cross-elasticities for beef production with respect to milk prices are not as high as those for hog prices, particularly for lower milk prices. In fact at the lowest milk and hog prices there are some positive cross-elasticities for beef production with respect to milk price, indicating complimentarity between beef and milk production. This case is caused by increasing milk prices making dairying (which requires forage production) profitable on farms with very limited capital and

Table 17. Cross-elasticities of supply at selected milk and hog prices for aggregate beef production with respect to milk prices[a]

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.20	2.60	3.00	3.40	3.80	4.20
11.10 or 12.60	+0.59	-0.12	-1.97	-11.11	-17.81	-78.40
14.10	+0.55	-0.36	-2.81	-7.89	-15.24	-78.40
15.60	- 0	-0.44	-1.37	-5.01	-13.82	-
17.10	0	0	0	0	-4.71	-
18.60	0	0	0	0	0	-

[a]Elasticities computed by formula, $\frac{\Delta q}{\Delta p} \cdot \frac{p}{q}$ using only grade B milk prices and sight estimated slopes at each milk price given.

thereby freeing capital from intensive row-cropping. Then, feeder steers which provide their own chattel for their purchase where feed is available, increase, to use up grain and other resources not required by the dairy dows as the dairy herd is increased. Without the dairy cows the feeder cattle do not show enough profit to divert the grain, capital and labor from the cash-grain system. As must always be the case, even cross-supply functions which are nearly vertical where quantity is very small, have high elasticities.

Aggregate Net Income from Programming Results

Changes in product prices in the programming models make substantial changes in the farm incomes computed. The computed aggregate net incomes for various milk and hog prices, where net income is defined as gross income minus variable costs, interest on borrowed capital and a depreciation charge for new buildings and equipment, are shown in figure 45 and table 18. There is nearly $200 million difference between the aggregate income for low prices and the aggregate income where prices are high. This difference amounts to approximately $6,600 per farm for the 29,361 farms in the 17 county area. Thus, if optimum adjustments were made, price level for milk and hogs would have a great effect on farm incomes. At projected prices ($3.00 per cwt. for grade B milk, $4.00 per cwt. for grade A milk and $14.10 per cwt. for hogs) aggregate net farm income from programming is $285 million. This amounts to an average of $9700 per farm. It would be higher for larger farms, less for small ones. Fixed costs, including taxes, interest on investment and depreciation for existing buildings, machines and equipment would have to be deducted from this amount to obtain a measure of return to operator and family labor and management. No estimate was made of present farm incomes, but it would almost certainly be less than that computed for any of the combinations of hog and milk prices.

Modifications of the Programming Model

Several modifications of the linear programming model were made. One was to investigate the effect of a change in beef prices on the farm plans. Beef prices have historically been somewhat less favorable for beef-feeders than those projected for 1965 and used in deriving farm plans in this study. Therefore, a set of beef prices which reflected the net

Figure 45. Aggregate net income for various prices of milk and hogs

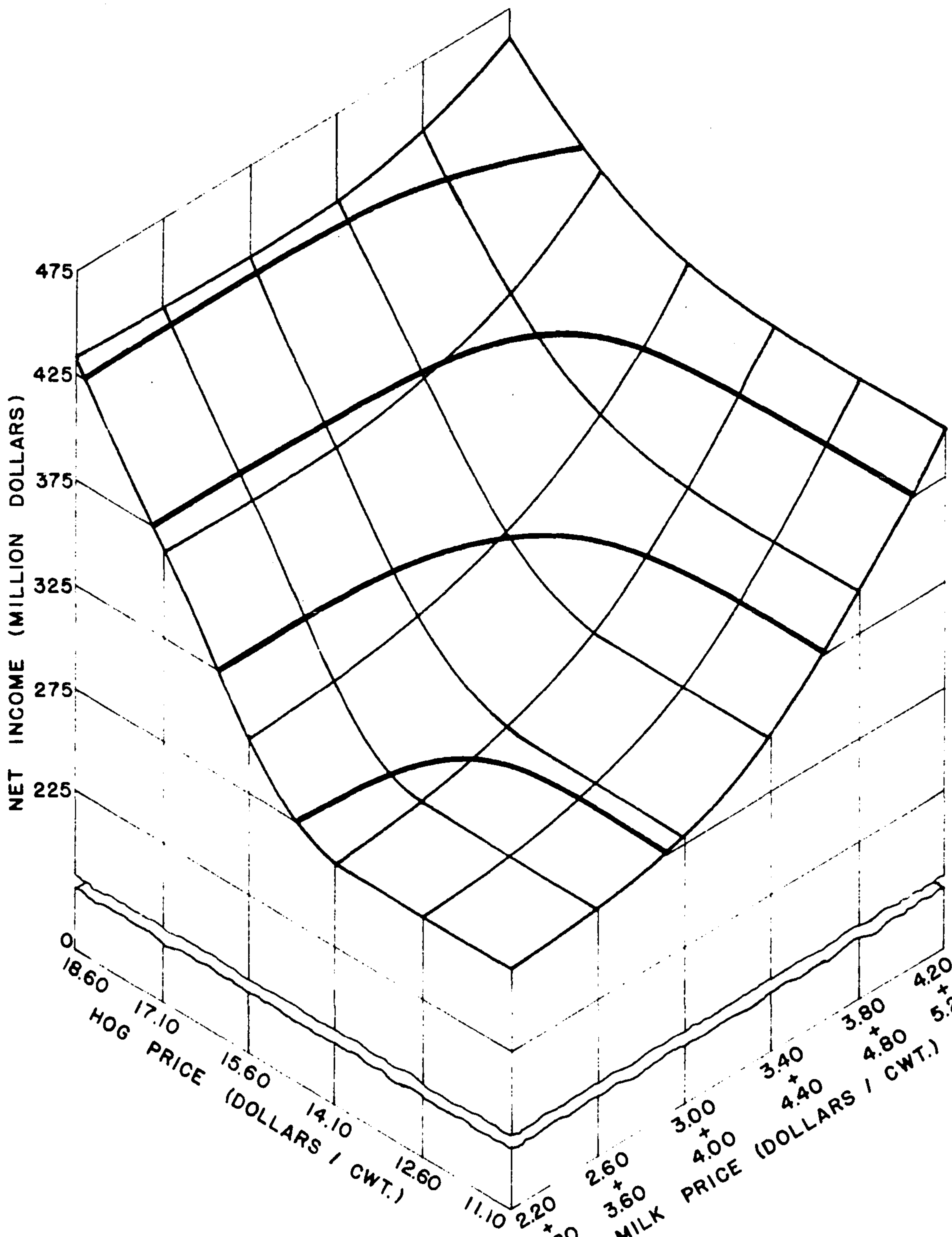

NET INCOME (MILLION DOLLARS)
225
275
325
375
425
475
0
18.60
17.10
15.60
14.10
12.60
11.10
HOG PRICE (DOLLARS / CWT.)
2.20 + 3.20
2.60 + 3.60
3.00 + 4.00
3.40 + 4.40
3.80 + 4.80
4.20 + 5.20
MILK PRICE (DOLLARS / CWT.)

Table 18. Aggregate net income from farm programming results, by milk price, by hog price

Hog price (dollars per cwt.)	Milk price (dollars per cwt.) 2.20 and 3.20	2.60 and 3.60	3.00 and 4.00	3.40 and 4.40	3.80 and 4.80	4.20 and 5.20
	million dollars	million dollars	million dollars	million dollars	million dollars	million dollars
11.10	266.9	272.8	283.6	305.7	351.2	403.1
12.60	266.9	272.8	283.6	305.7	351.2	403.1
14.10	269.8	274.6	285.1	306.1	351.2	403.1
15.60	307.0	310.0	317.6	334.2	361.3	407.0
17.10	366.6	367.0	369.9	381.2	396.1	426.9
18.60	432.9	432.9	434.8	438.1	449.2	460.9

feeding margins obtained in the past two complete cattle cycles (1938-58) was used in computing a few farm plans for comparison to the plans explained above. The same input-output coefficients and prices, except for the beef prices, were used.

Another modification was to compute a few plans where farm expansion in terms of land and labor was an alternative use for the farms' capital resources. This increased flexibility of resources could be thought of as a long-run adjustment for particular farms. Increased or decreased sizes would not be possible for all farm types, because of the limitation or surplus of labor and particularly land resources in the aggregate.

The effects of excluding expansion in dairy facilities and of limiting investment in additional dairy facilities to expansion of stanchion barns were also observed.

Effect of smaller beef-feeding margins

Beef was a major competitive product which was not programmed with varied prices. A few farm plans were computed with lower beef-feeding margins than those which were used for computing farm plans shown in the previous chapter. These lower margins are the average net margin over the last two complete cattle cycles. Prices for slaughter steers are from the Chicago market, while feeder steer prices are based on the Kansas City market. The price data were obtained from livestock and meat statistics (62, 63, 64). Transportation costs and marketing changes are accounted for where they would be incurred by the farmer, or where they would be included in the "on-the-farm" price. The previously used, 1965 projections were net, "on-the-farm" prices. Both sets of prices were based on the price of choice fed cattle in October at $23.50 per cwt. But, for the lower feeding margins, the "on-the-farm" margin amounts to $1.10 per hundred-weight for calves and $0.58 per hundredweight for medium yearling steers. These margins compare with $1.00 per hundredweight margin for calves and $3.00 per hundredweight for steers which were used previously.

The results of the program solutions for the less favorable beef prices are shown in figures 46 to 51. The sets of plans for the lower beef margins are compared with the plans for higher beef margins. For the few program solutions obtained, the following main changes seem to

Figure 46. Farm plans for small dairy farms in Soil Area I (Farm I-4) for low and high beef-feeding margins at varied milk prices with hog prices set at $12.60 per cwt.

Code	Enterprises
I-4 A_2	3 acres comm 94 acres cccc 17 pasture calves
I-4 B_2	4 acres comm 93 acres cccc 5 cows (stanchion)
I-4 C_2	74 acres comm 23 acres cccc 18 cows (stanchion)
I-4 D_2	97 acres comm 23 cows (stanchion)
I-4 E_2	57 acres comm 40 acres cccc 26 cows (stanchion)
I-4 F_2	93 acres comm 4 acres cccc 23 cows (stanchion) 2332 bu. buy corn
I-4 G_2	94 acres comm 3 acres cccc 34 cows (stanchion) 2381 bu. buy corn

Code	Enterprises
I-4 H_2	3 acres comm 94 acres cccc 119 med. yrlgs.
I-4 I_2	36 acres comm 61 acres cccc 18 cows (stanchion) 39 med. yrlgs.
I-4 J_2	72 acres comm 25 acres cccc 31 cows (stanchion) 18 med. yrlgs. 2304 bu. buy corn
I-4 K_2	91 acres comm 6 acres cccc 33 cows (stanchion) 15 med. yrlgs. 2953 bu. buy corn
I-4 L_2	94 acres comm 3 acres cccc 34 cows (stanchion) 2383 bu. buy corn

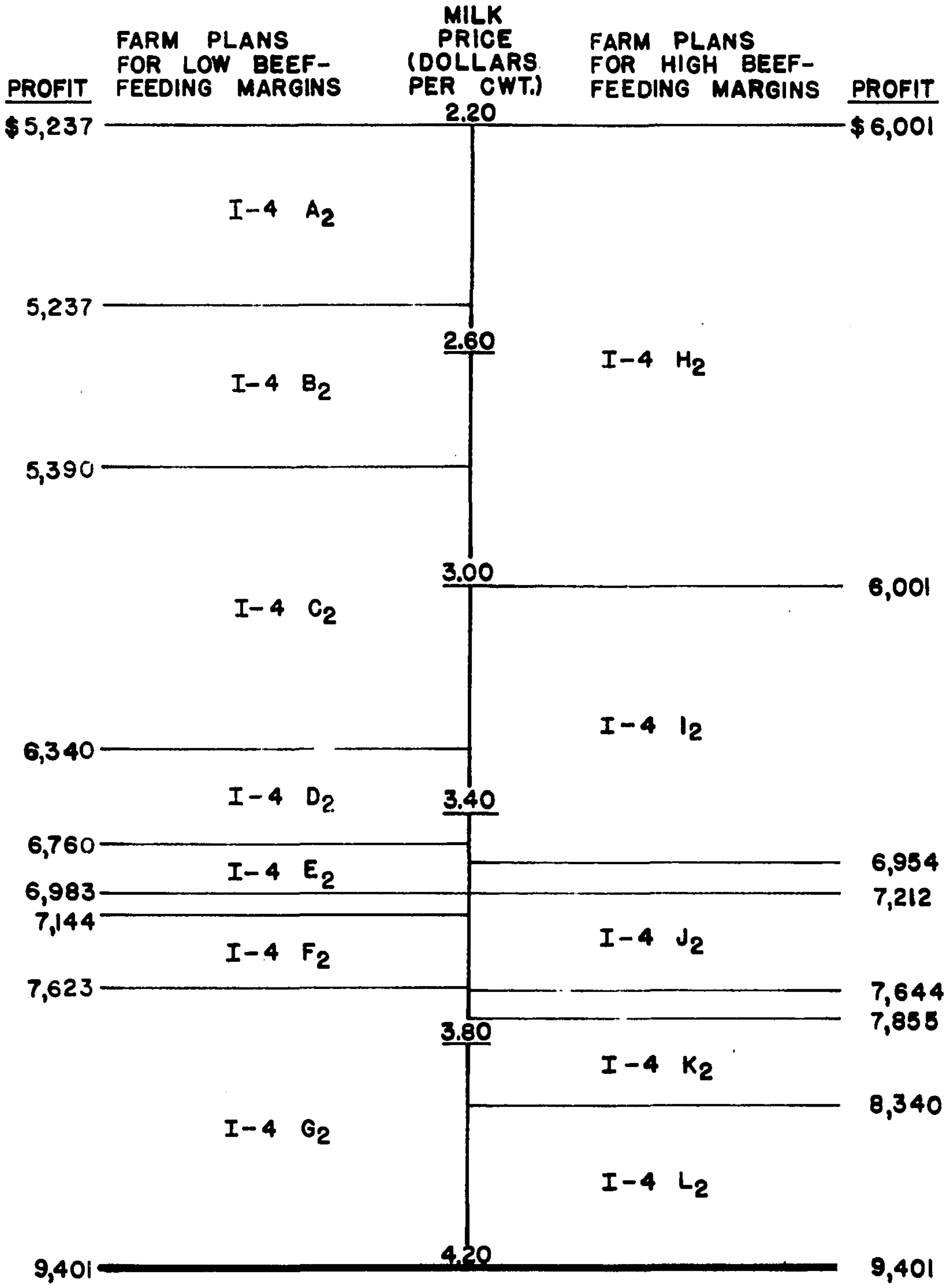

PROFIT
FARM PLANS FOR LOW BEEF-FEEDING MARGINS
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS FOR HIGH BEEF-FEEDING MARGINS
PROFIT
$5,237
2.20
$6,001
I-4 A2
5,237
2.60
I-4 B2
I-4 H2
5,390
3.00
6,001
I-4 C2
I-4 I2
6,340
I-4 D2
3.40
6,760
6,954
I-4 E2
6,983
7,212
7,144
I-4 F2
I-4 J2
7,623
7,644
7,855
3.80
I-4 K2
8,340
I-4 G2
I-4 L2
9,401
4.20
9,401

Figure 47. Farm plans for small dairy farms in Soil Area I (Farm I-4) for low and high beef-feeding margins at varied milk prices with hog prices set at $15.60 per cwt.

Code	Enterprises
I-4 A_4	24 acres comm 73 acres cccc 33 sows (2 litters) 1870 bu. buy corn
I-4 B_4	32 acres comm 65 acres cccc 28 sows (2 litters) 5 cows (stanchion) 2036 bu. buy corn
I-4 C_4	53 acres comm 44 acres cccc 17 sows (2 litters) 18 cows (stanchion) 2466 bu. buy corn
I-4 D_4	63 acres comm 34 acres cccc 12 sows (2 litters) 24 cows (stanchion) 2659 bu. buy corn
I-4 E_4	71 acres comm 26 acres cccc 9 sows (2 litters) 29 cows (stanchion) 2817 bu. buy corn

Code	Enterprises
I-4 F_4	19 acres comm 78 acres cccc 28 sows (2 litters) 18 med. yrlgs. 1661 bu. buy corn
I-4 G_4	54 acres comm 43 acres cccc 17 sows (2 litters) 18 cows (stanchion) 2466 bu. buy corn
I-4 H_4	63 acres comm 34 acres cccc 12 sows (2 litters) 24 cows (stanchion) 2659 bu. buy corn
I-4 I_4	71 acres comm 26 acres cccc 9 sows (2 litters) 29 cows (stanchion) 2817 bu. buy corn

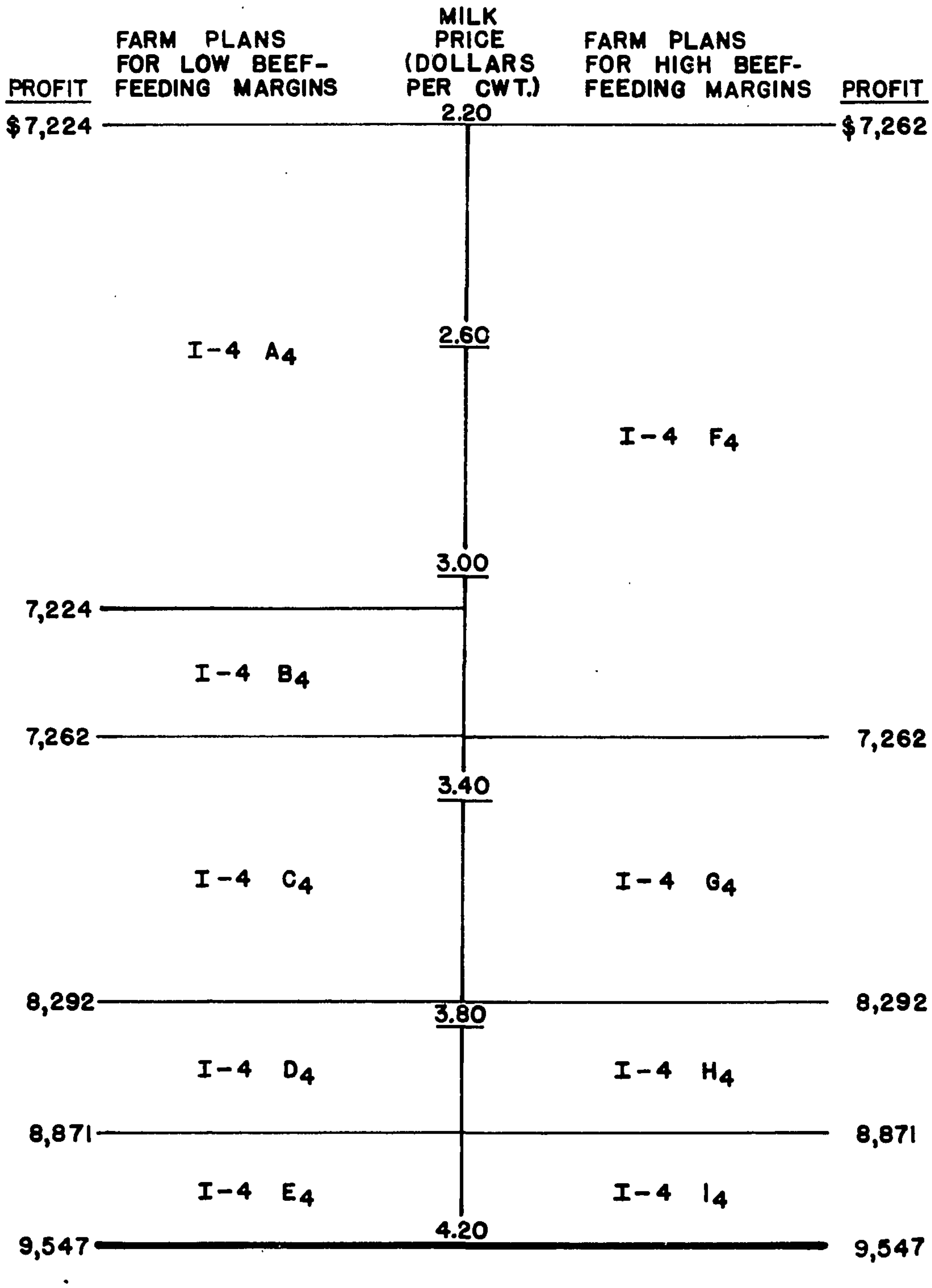

PROFIT
FARM PLANS FOR LOW BEEF-FEEDING MARGINS
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS FOR HIGH BEEF-FEEDING MARGINS
PROFIT
$7,224
2.20
$7,262
2.60
I-4 A4
I-4 F4
3.00
7,224
I-4 B4
7,262
7,262
3.40
I-4 C4
I-4 G4
8,292
3.80
8,292
I-4 D4
I-4 H4
8,871
8,871
I-4 E4
I-4 I4
9,547
4.20
9,547

Figure 48. **Farm plans for large non-dairy farms in Soil Area II (Farm II-3) for low and high beef-feeding margins at varied milk prices with hog prices set at $14.10 per cwt.**

Code	Enterprises	Code	Enterprises
II-3 A_3	91 acres comm 99 acres cccc 21 sows (2 litters) 45 def. fed calves	II-3 C_3	97 acres comm 93 acres cccc 3 sows (2 litters) 189 med. yrlgs.
II-3 B_3	190 acres comm 47 cows (parlor) 868 bu. buy corn	II-3 D_3	190 acres comm 47 cows (parlor) 868 bu. buy corn

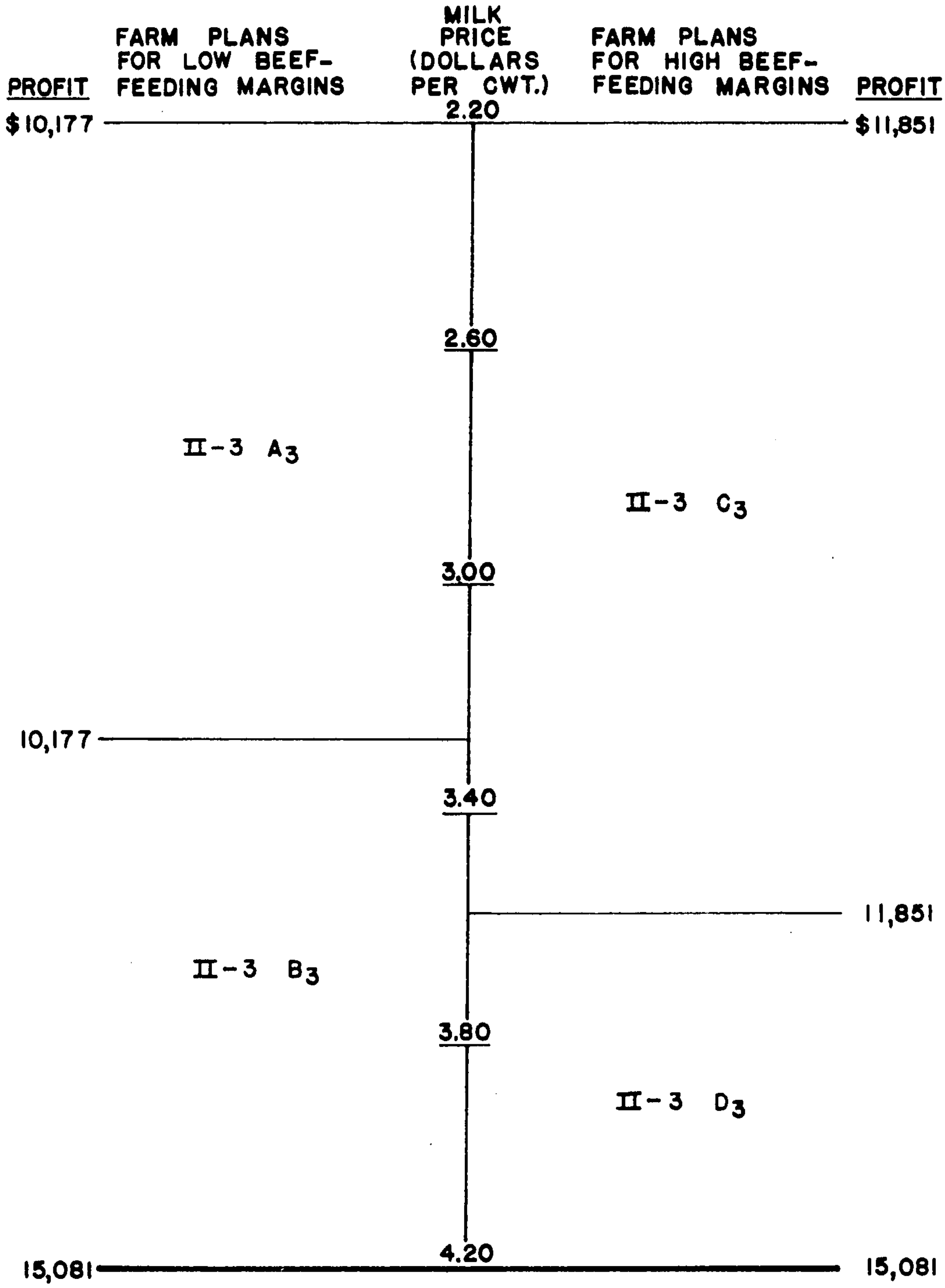

PROFIT
FARM PLANS FOR LOW BEEF-FEEDING MARGINS
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS FOR HIGH BEEF-FEEDING MARGINS
PROFIT
$10,177
2.20
$11,851
2.60
II-3 A3
II-3 C3
3.00
10,177
3.40
11,851
II-3 B3
3.80
II-3 D3
15,081
4.20
15,081

Figure 49. Farm plans for large non-dairy farms in Soil Area II (Farm II-3) for low and high beef-feeding margins at varied milk prices with hog prices set at $12.60 per cwt.

Code	Enterprises	Code	Enterprises
II-3 A_2	91 acres comm 99 acres cccc 85 pasture calves 7 def. fed calves	II-3 C_2	94 acres comm 96 acres cccc 202 med. yrlgs.
II-3 B_2	190 acres comm 47 cows (parlor) 868 bu. buy corn	II-3 D_2	190 acres comm 47 cows (parlor) 868 bu. buy corn

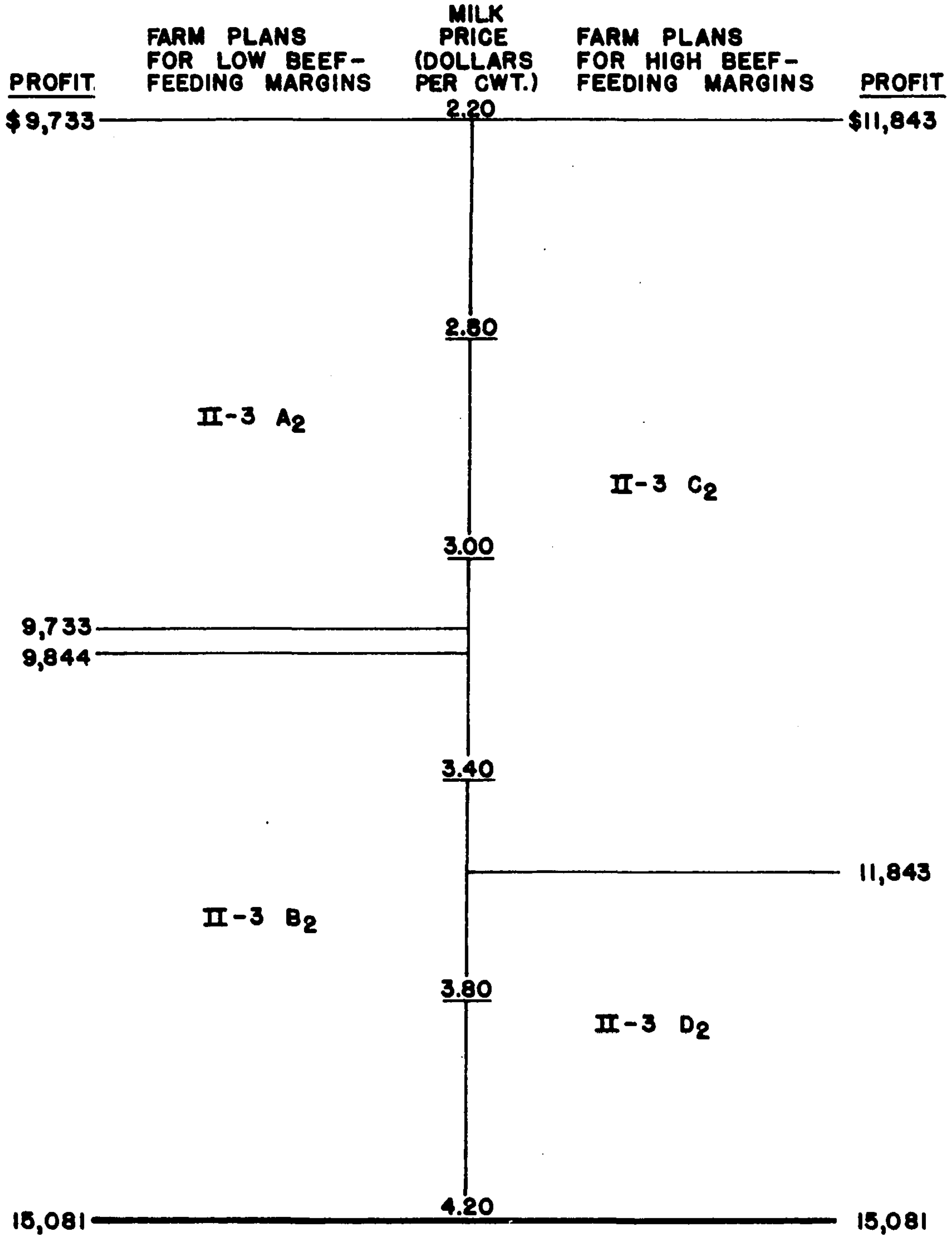

PROFIT
FARM PLANS FOR LOW BEEF-FEEDING MARGINS
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS FOR HIGH BEEF-FEEDING MARGINS
PROFIT
$9,733
2.20
$11,843
2.80
II-3 A2
II-3 C2
3.00
9,733
9,844
3.40
11,843
II-3 B2
3.80
II-3 D2
15,081
4.20
15,081

Figure 50. Farm plans for large dairy farms in Soil Area I (Farm II-5) for low and high beef-feeding margins at varied milk prices with hog prices set at $12.60 per cwt.

Code	Enterprises
II-5 A_2	5 acres comm 192 acres cccc 14 pasture calves 4 def. fed calves
II-5 B_2	13 acres comm 184 acres cccc 7 cows (stanchion)
II-5 C_2	75 acres comm 122 acres cccc 19 cows (stanchion)
II-5 D_2	197 acres comm 44 cows (stanchion)
II-5 E_2	180 acres comm 17 acres cccc 47 cows (stanchion)
II-5 F_2	197 acres comm 52 cows (parlor) 1529 bu. buy corn

Code	Enterprises
II-5 G_2	5 acres comm 192 acres cccc 17 med. yrlgs. 3 def. fed calves
II-5 H_2	138 acres comm 59 acres cccc 17 cows (stanchion) 129 med. yrlgs.
II-5 I_2	131 acres comm 66 acres cccc 19 cows (stanchion) 123 med. yrlgs.
II-5 J_2	197 acres comm 40 cows (stanchion) 19 med. yrlgs.
II-5 K_2	163 acres comm 34 acres cccc 43 cows (stanchion) 19 med. yrlgs.
II-5 L_2	197 acres comm 52 cows (parlor) 1529 bu. buy corn

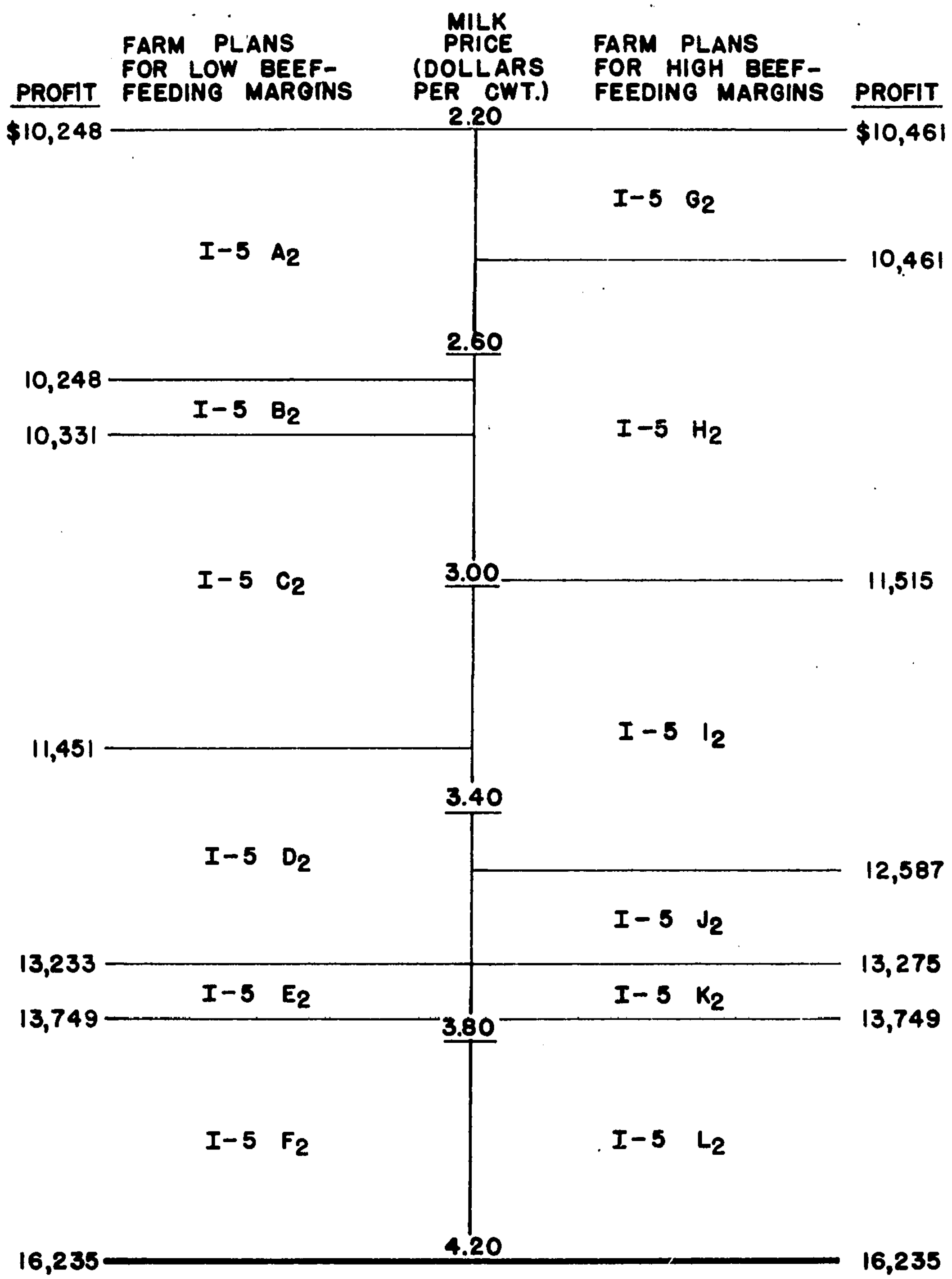
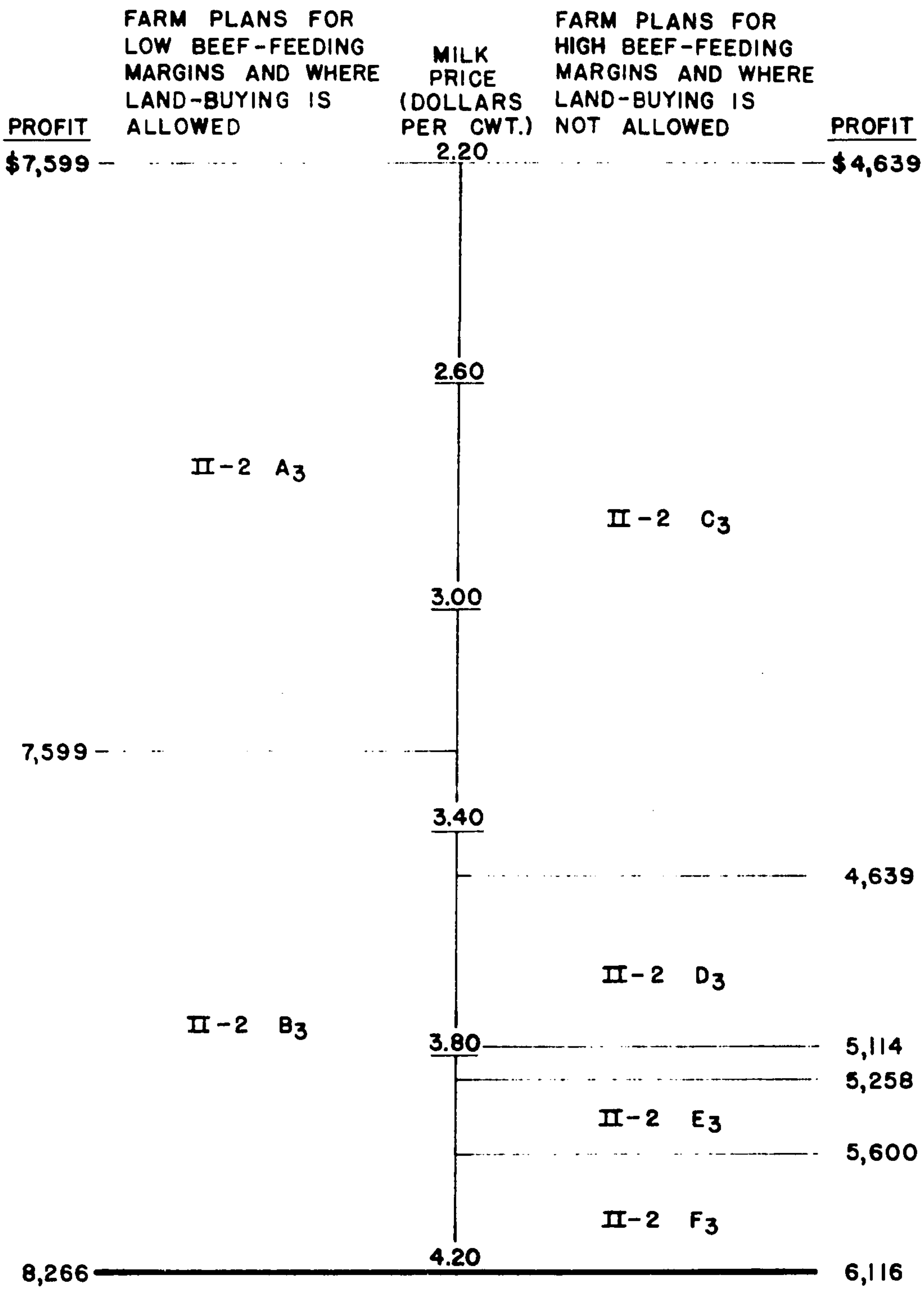

MILK PRICE (DOLLARS PER CWT.)
FARM PLANS FOR LOW BEEF-FEEDING MARGINS
FARM PLANS FOR HIGH BEEF-FEEDING MARGINS
PROFIT
PROFIT
2.20
$10,248
$10,461
I-5 G2
I-5 A2
10,461
2.60
10,248
I-5 B2
10,331
I-5 H2
I-5 C2
3.00
11,515
11,451
I-5 I2
3.40
I-5 D2
12,587
I-5 J2
13,233
13,275
I-5 E2
I-5 K2
13,749
3.80
13,749
I-5 F2
I-5 L2
4.20
16,235
16,235

Figure 51. Farm plans for small non-dairy farms in Soil Area II (Farm II-2) for low beef-feeding margins where land-buying is allowed and for high beef-feeding margins where land-buying is not allowed at varied milk prices with hog prices set at $14.10 per cwt.

Code	Enterprises
II-2 A_3	171 acres ccom 10 sows (2 litters) 50 def. fed calves
II-2 B_3	160 acres ccom 13 acres cccc 7 sows (2 litters) 6 cows (stanchion) 33 def. fed calves
II-2 C_3	35 acres comm 38 acres cccc 8 sows (2 litters) 60 med. yrlgs. 1010 bu. buy corn
II-2 D_3	39 acres comm 34 acres cccc 16 cows (stanchion) 33 def. fed calves 1026 bu. buy corn
II-2 E_3	66 acres comm 7 acres cccc 22 cows (stanchion) 968 bu. buy corn
II-2 F_3	73 acres comm 23 cows (stanchion) 1246 bu. buy corn


PROFIT
FARM PLANS FOR LOW BEEF-FEEDING MARGINS AND WHERE LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS FOR HIGH BEEF-FEEDING MARGINS AND WHERE LAND-BUYING IS NOT ALLOWED
PROFIT
$7,599
2.20
$4,639
2.60
II-2 A3
II-2 C3
3.00
7,599
3.40
4,639
II-2 D3
II-2 B3
3.80
5,114
5,258
II-2 E3
5,600
II-2 F3
4.20
8,266
6,116

be effected by the lower feeding margins:

(1) Cash grain farming becomes more profitable than beef-feeding at low milk and pork prices, except that enough calves are kept to use forage produced on permanent pastures and in rotations where necessary to achieve erosion control objectives.

(2) Hog production becomes profitable at about $0.20 to $0.60 per hundredweight lower hog prices, due to a less competition from beef for available farm resources. Lower beef prices lowers opportunity costs for hogs.

(3) Milk production ordinarily becomes profitable at $0.20 to $0.40 per hundredweight lower milk price than is the case for high beef-feeding margins. Again, this is due to less competition from beef for available resources. In one case, however, (at low hog prices on the large dairy farm in Soil Area I) the lowering of the beef-feeding margin made calves relatively more profitable than drylot-fed medium yearlings which caused the minimum price for milk production to rise. This situation was brought about by the shortage of operating capital on this type of farm. Calves and steers can be bought with no equity where feed is available, as is the case here. But, calves are not profitable enough to jointly with cows drive the cropping system from the mostly heavily fertilized, continuous corn to other rotations where the capital use is not so great. Thus, the lowered beef margins destroy the complementarity between

feeder cattle and milk cows in use of capital which occurred under more favorable beef-feeding margins.

(4) The aggregate beef production shown previously in the aggregate beef production surface would be decreased substantially if all farms were programmed with lower beef-feeding margins. Also, milk and pork production would be higher at their lower price ranges.

(5) Less favorable beef prices reduce farm incomes up to $2000 per farm depending on the importance of beef in the high-margin farm plans.

The farm expansion alternative

Since the programming done in this study is to represent all farms of the region, expansion of farm size and unlimited labor-hiring were not allowed because of the impossibility of all farms in a given area expanding use of these resources. Too, the adjustment period specified is rather short (to 1965).

For a few farm types, using a few of the possible milk price-hog price combinations, programs were computed where land-buying and year-round labor-buying were incorporated. These few programs do give indications of the types of adjustments which would be profitable on many types of farms under the assumption that farm resource quantities are flexible. Both large and small farms were programmed with the farm expansion alternatives.

In the land-buying activities, land prices (by county) given by Murray and Gadsby (37) are used. No deduction from farm profits is made for repayment of principal, since it is assumed the asset value approximately equals the principal payments. The average interest charge over a twenty year repayment schedule, in addition to property tax costs is charged against farm income. Long-term capital borrowing capacity is charged on the basis of needing 50 percent equity to purchase land.

The labor-buying activity is limited to year-round labor purchase, since seasonal labor is not usually available in certain seasons and in large amounts. Results of these models which allow increased flexibility are summarized in figures 51 to 57. One program (summarized in figure 51) was computed using both the low beef margins and the farm expansion alternatives to test the interaction of these two conditions. However, no particular interacting could be observed. No conclusions could be reached using this combination of activities, which was not characteristic of the two model-changing processes singly.

Some of the main points observable from figures 51 to 57 are:

(1) Land purchase is profitable for every type of farm and for every level of hog and milk prices where the profitability of this activity was investigated. Farm expansion is decreased, but only slightly, at very high prices for milk or hogs since the long-term capital is used for increasing building space.

(2) On farms which already have dairy housing, milk production becomes profitable at lower milk prices than is the case where farm expansion is prohibited. This characteristic is primarily due to additional forage availability from the larger size farms. On farms where dairy housing is not presently available,

Figure 52. Farm plans for small dairy farms in Soil Area II (Farm II-4) where labor- and land-buying is, and is not allowed at varied milk prices with hog prices set at \$14.10 per cwt.

Code	Enterprises	Code	Enterprises
II-4 A_3	163 acres ccom 14 sows (2 litters) 49 def. fed calves	II-4 E_3	35 acres comm 13 acres ccom 43 acres cccc 104 med. yrlgs. 80 bu. buy corn
II-4 B_3	160 acres ccom 15 acres cccc 14 sows (2 litters) 11 cows (stanchion) 18 def. fed calves	II-4 F_3	44 acres comm 47 acres cccc 14 sows (2 litters) 8 cows (stanchion) 18 med. yrlgs.
II-4 C_3	166 acres ccom 9 acres cccc 14 sows (2 litters) 16 cows (stanchion) 18 med. yrlgs.	II-4 G_3	44 acres comm 47 acres cccc 5 sows (2 litters) 16 cows (stanchion) 18 med. yrlgs.
II-4 D_3	158 acres ccom 14 acres cccc 14 sows (2 litters) 17 cows (stanchion) 18 med. yrlgs.	II-4 H_3	43 acres comm 47 acres cccc 22 cows (stanchion) 18 med. yrlgs.
		II-4 I_3	73 acres comm 18 acres cccc 27 cows (stanchion) 18 med. yrlgs. 1598 bu. buy corn
		II-4 J_3	91 acres comm 29 cows (stanchion) 9 med. yrlgs. 1942 bu. buy corn

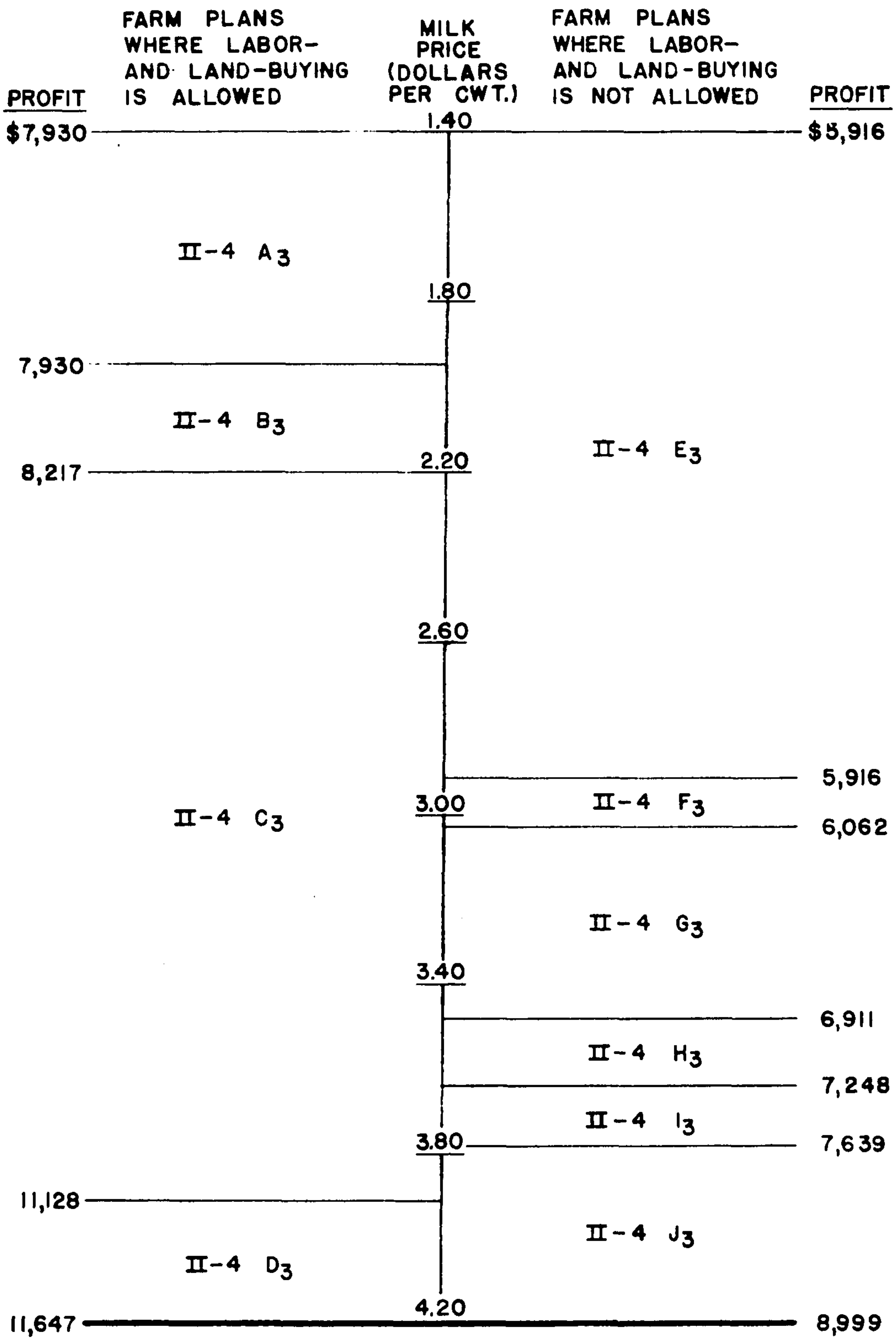

PROFIT
FARM PLANS WHERE LABOR- AND LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS WHERE LABOR- AND LAND-BUYING IS NOT ALLOWED
PROFIT
$7,930
1.40
$5,916
II-4 A3
1.80
7,930
II-4 B3
8,217
2.20
II-4 E3
2.60
5,916
3.00
II-4 F3
II-4 C3
6,062
II-4 G3
3.40
6,911
II-4 H3
7,248
II-4 I3
3.80
7,639
11,128
II-4 J3
II-4 D3
4.20
11,647
8,999

Figure 53. Farm plans for small non-dairy farms in Soil Area I (Farm I-2) where labor- and land-buying is, and is not allowed at varied milk prices with hog prices set at $15.60 per cwt.

Code	Enterprises
I-2 A_4	14 acres comm 148 acres cccc 7 sows (2 litters) 34 med. yrlgs.
I-2 B_4	23 acres comm 53 acres cccc 30 sows (2 litters) 4 med yrlgs. 2970 bu. buy corn
I-2 C_4	76 acres comm 7 sows (2 litters) 21 cows (stanchion) 2403 bu. buy corn

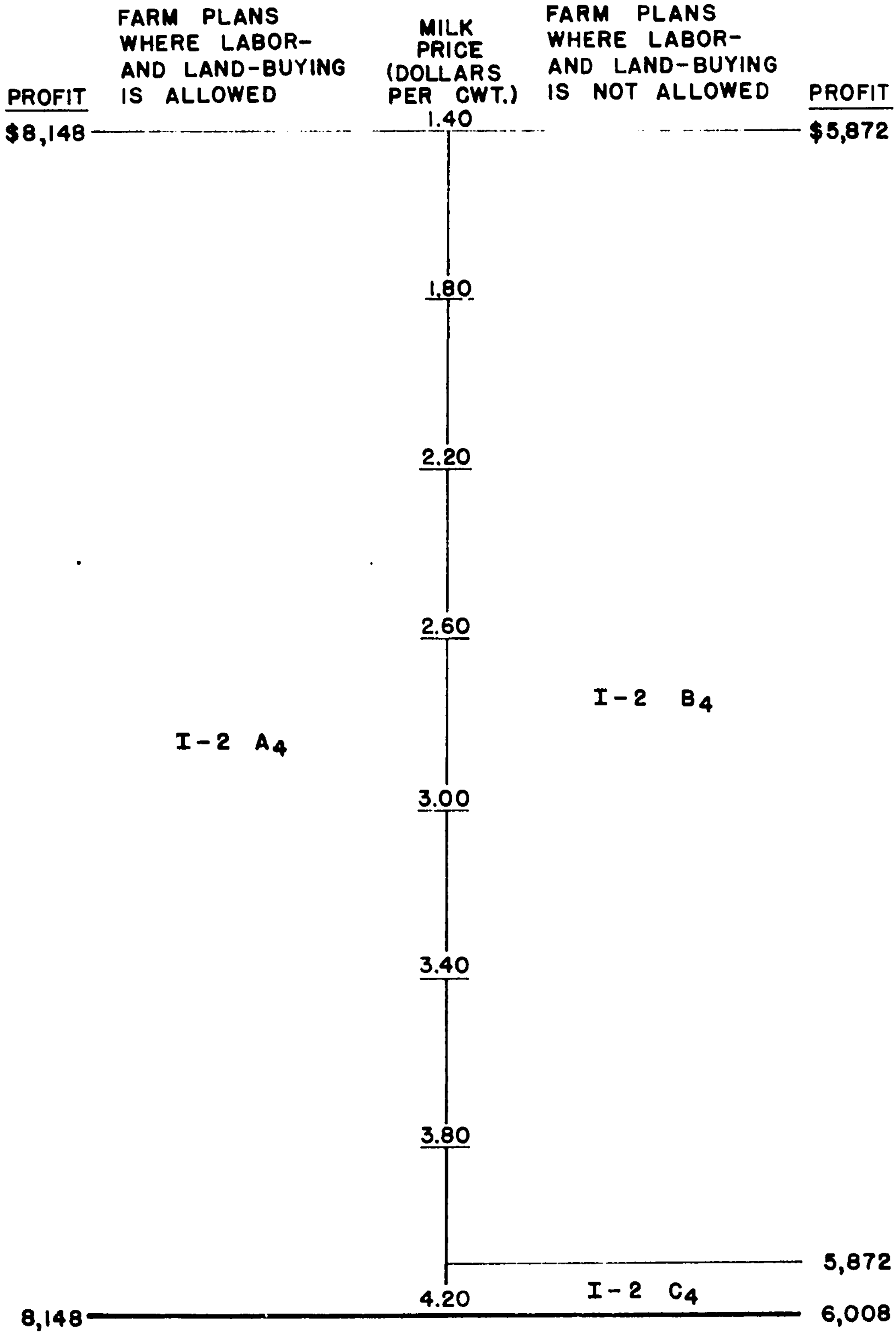

PROFIT
FARM PLANS WHERE LABOR- AND LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS WHERE LABOR- AND LAND-BUYING IS NOT ALLOWED
PROFIT
$8,148
1.40
$5,872
1.80
2.20
2.60
I-2 B4
I-2 A4
3.00
3.40
3.80
5,872
4.20
I-2 C4
8,148
6,008

Figure 54. Farm plans for large dairy farms in Soil Area I (Farm I-5) where labor- and land-buying is, and is not allowed at varied milk prices with hog prices set at $14.10 per cwt.

Code	Enterprises
I-5 A_3	105 acres comm
	149 acres ccom
	16 sows (2 litters)
	91 def. fed calves
I-5 B_3	99 acres comm
	192 acres ccom
	14 cows (stanchion)
	66 def. fed calves
I-5 C_3	160 acres comm
	138 acres ccom
	19 cows (stanchion)
	69 def. fed calves
I-5 D_3	193 acres comm
	110 acres ccom
	22 cows (stanchion)
	71 def. fed calves
I-5 E_3	144 acres comm
	185 acres ccom
	25 cows (stanchion)
	45 def. fed calves
I-5 F_3	200 acres comm
	75 acres cccc
	39 cows (stanchion)
	19 med. yrlgs.
I-5 G_3	203 acres comm
	62 acres cccc
	42 cows (stanchion)
	19 med. yrlgs.

Code	Enterprises
I-5 H_3	31 acres comm
	166 acres cccc
	16 sows (2 litters)
	9 med. yrlgs.
I-5 I_3	120 acres comm
	77 acres cccc
	16 sows (2 litters)
	11 cows (stanchion)
	89 med. yrlgs.
I-5 J_3	118 acres comm
	79 acres cccc
	11 sows (2 litters)
	14 cows
	96 med. yrlgs.
I-5 K_3	128 acres comm
	69 acres cccc
	12 sows (2 litters)
	19 cows (stanchion)
	71 med. yrlgs.
I-5 L_3	149 acres comm
	48 acres cccc
	14 sows (2 litters)
	28 cows (stanchion)
	19 med. yrlgs.
I-5 M_3	163 acres comm
	34 acres cccc
	43 cows (stanchion)
	19 med. yrlgs.
I-5 N_3	197 acres comm
	52 cows (stanchion)
	1529 bu. buy corn

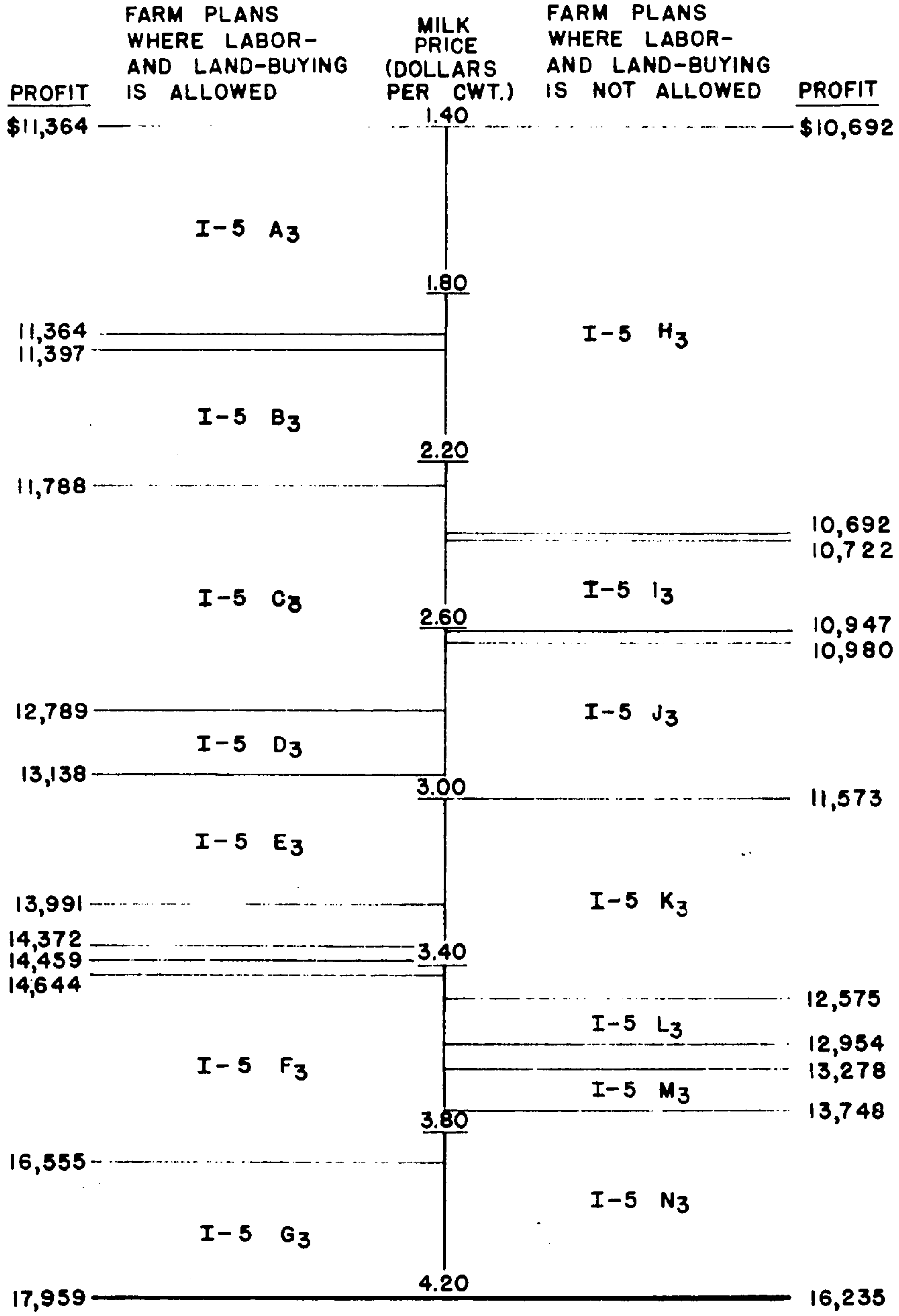

PROFIT
FARM PLANS WHERE LABOR- AND LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS WHERE LABOR- AND LAND-BUYING IS NOT ALLOWED
PROFIT
$11,364
1.40
$10,692
I-5 A3
1.80
I-5 H3
11,364
11,397
I-5 B3
2.20
11,788
10,692
10,722
I-5 C3
I-5 I3
2.60
10,947
10,980
12,789
I-5 J3
I-5 D3
13,138
3.00
11,573
I-5 E3
13,991
I-5 K3
14,372
14,459
3.40
14,644
12,575
I-5 L3
12,954
I-5 F3
13,278
I-5 M3
13,748
3.80
16,555
I-5 N3
I-5 G3
4.20
17,959
16,235

Figure 55. Farm plans for large dairy farms in Soil Area I (Farm I-5) where labor- and land-buying is, and is not allowed at varied milk prices with hog prices set at $17.10 per cwt.

Code	Enterprises
I-5 A_5	169 acres ccom 56 acres cccc 41 sows (2 litters) 14 sows (1 litter) 11 beef cows
I-5 B_5	112 acres comm 144 acres ccom 32 sows (2 litters) 28 cows (stanchion)
I-5 C_5	151 acres comm 113 acres ccom 29 sows (2 litters) 33 cows (stanchion)
I-5 D_5	142 acres comm 123 acres ccom 24 sows (2 litters) 36 cows (stanchion)
I-5 E_5	221 acres comm 41 acres cccc 20 sows (2 litters) 41 cows (stanchion)

Code	Enterprises
I-5 F_5	33 acres comm 37 acres ccom 127 acres cccc 37 sows (2 litters) 24 sows (1 litter)
I-5 G_5	148 acres comm 49 acres cccc 27 sows (2 litters) 25 cows (stanchion) 1385 bu. buy corn
I-5 H_5	153 acres comm 44 acres cccc 23 sows (2 litters) 29 cows (stanchion) 1469 bu. buy corn

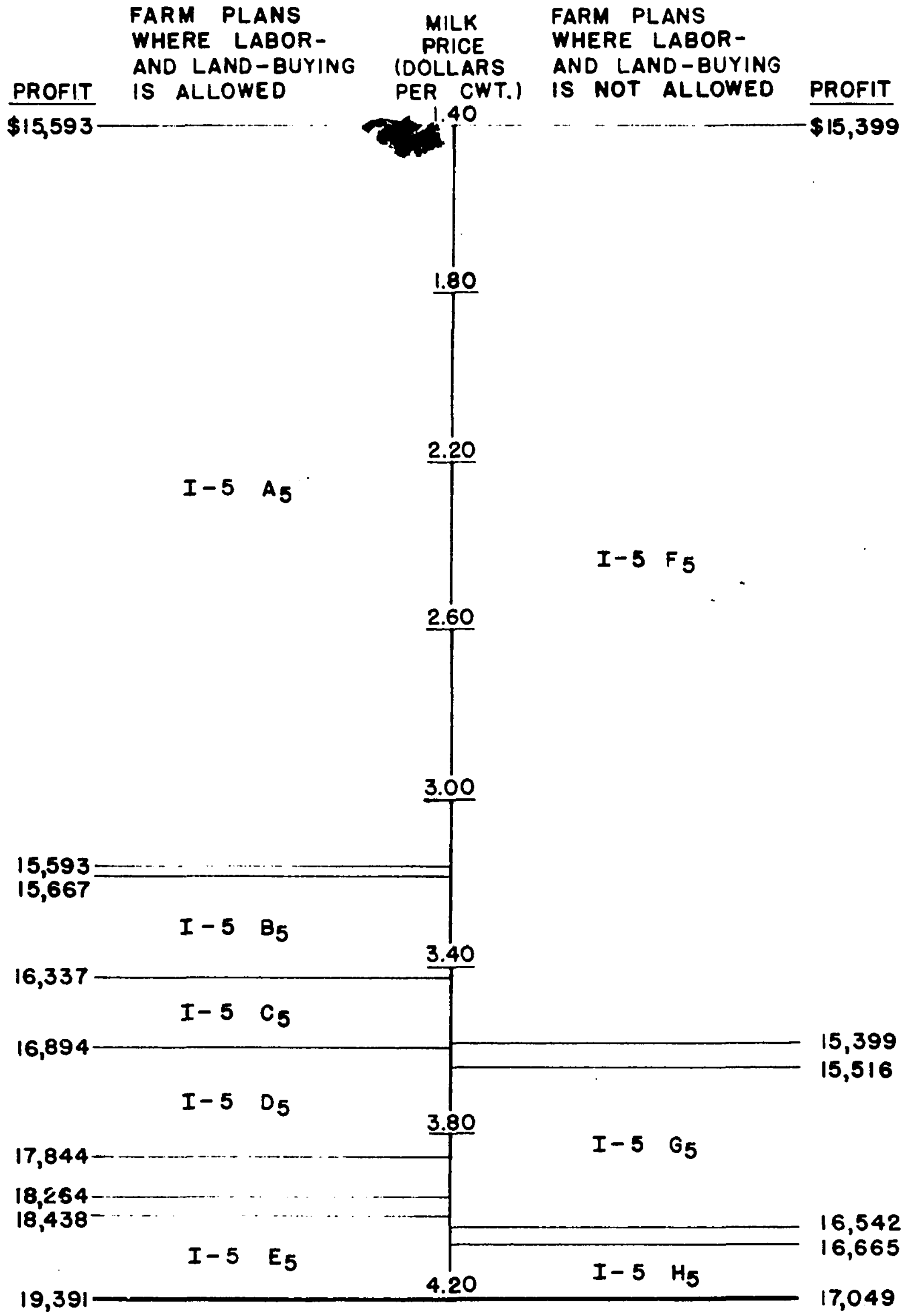
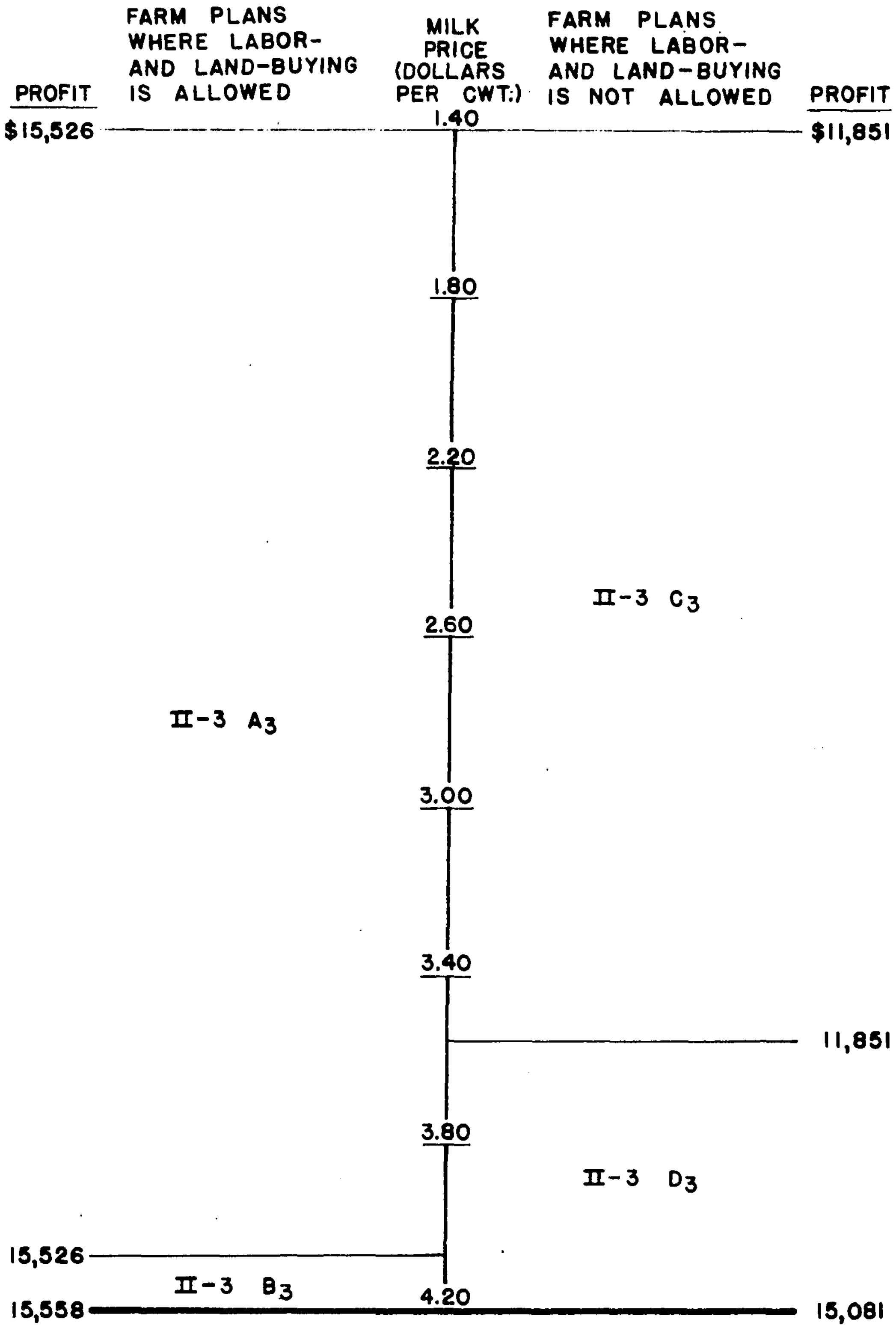

PROFIT
FARM PLANS WHERE LABOR- AND LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS WHERE LABOR- AND LAND-BUYING IS NOT ALLOWED
PROFIT
$15,593
1.40
$15,399
1.80
2.20
I-5 A5
I-5 F5
2.60
3.00
15,593
15,667
I-5 B5
3.40
16,337
I-5 C5
15,399
16,894
15,516
I-5 D5
3.80
I-5 G5
17,844
18,264
18,438
16,542
16,665
I-5 E5
I-5 H5
4.20
19,391
17,049

Figure 56. Farm plans for large non-dairy farms in Soil Area II (Farm II-3) where labor- and land-buying is, and is not allowed at varied milk prices with hog prices set at \$14.10 per cwt.

Code	Enterprises	Code	Enterprises
II-3 A_3	315 acres ccom 22 acres cccc 76 med. yrlgs. 73 def. fed calves	II-3 C_3	97 acres comm 93 acres cccc 3 sows (2 litters) 189 med. yrlgs.
II-3 B_3	228 acres comm 45 cows (parlor) 7 med. yrlgs.	II-3 D_3	190 acres comm 47 cows (parlor) 868 bu. buy corn

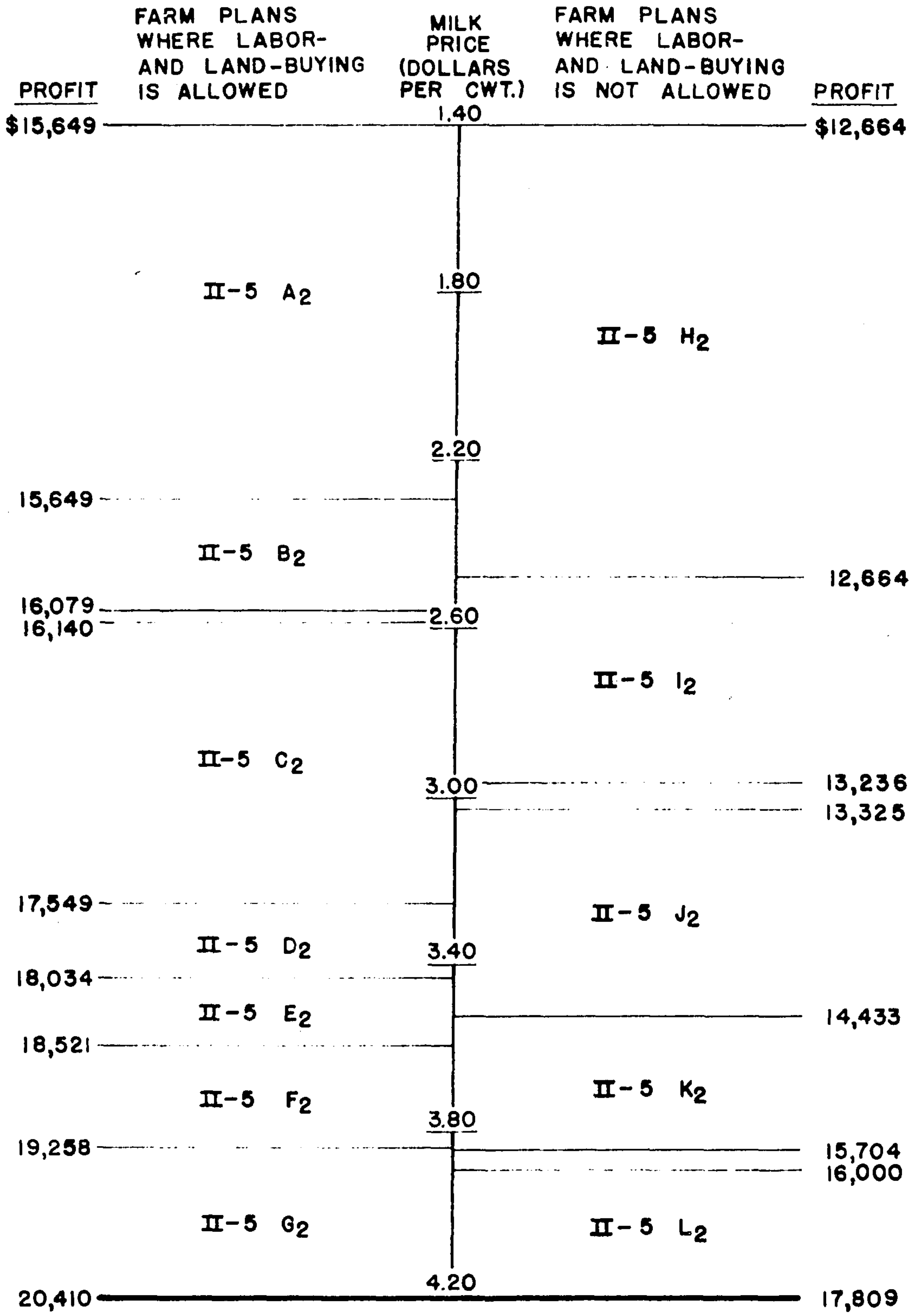


PROFIT
FARM PLANS WHERE LABOR- AND LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS WHERE LABOR- AND LAND-BUYING IS NOT ALLOWED
PROFIT
$15,526
1.40
$11,851
1.80
2.20
II-3 C3
2.60
II-3 A3
3.00
3.40
11,851
3.80
II-3 D3
15,526
II-3 B3
4.20
15,558
15,081

Figure 57. Farm plans for large dairy farms in Soil Area II (Farm II-5) where labor- and land-buying is, and is not allowed at varied milk prices with hog prices set at $12.60 per cwt.

Code	Enterprises
II-5 A_2	346 acres ccom 109 def. fed calves
II-5 B_2	361 acres ccom 16 cows (stanchion) 65 def. fed calves
II-5 C_2	45 acres comm 321 acres ccom 21 cows (stanchion) 63 def. fed calves
II-5 D_2	360 acres ccom 24 cows (stanchion) 48 med. yrlgs.
II-5 E_2	338 acres ccom 27 cows (stanchion) 57 med. yrlgs. 15 def. fed calves
II-5 F_2	321 acres comm 8 acres cccc 29 cows (stanchion) 71 med. yrlgs.
II-5 G_2	321 acres comm 7 acres cccc 32 cows (stanchion) 42 med. yrlgs.

Code	Enterprises
II-5 H_2	212 acres ccom 3 acres cccc 213 med. yrlgs.
II-5 I_2	129 acres comm 86 acres cccc 10 cows (stanchion) 187 med. yrlgs.
II-5 J_2	158 acres comm 57 acres cccc 21 cows (stanchion) 133 med. yrlgs.
II-5 K_2	207 acres comm 8 acres cccc 40 cows (stanchion) 43 med. yrlgs.
II-5 L_2	215 acres comm 52 cows (parlor) 407 bu. buy corn


PROFIT
FARM PLANS WHERE LABOR- AND LAND-BUYING IS ALLOWED
MILK PRICE (DOLLARS PER CWT.)
FARM PLANS WHERE LABOR- AND LAND-BUYING IS NOT ALLOWED
PROFIT
$15,649
1.40
$12,664
II-5 A2
1.80
II-5 H2
2.20
15,649
II-5 B2
12,664
16,079
16,140
2.60
II-5 I2
II-5 C2
3.00
13,236
13,325
17,549
II-5 J2
II-5 D2
3.40
18,034
II-5 E2
14,433
18,521
II-5 K2
II-5 F2
3.80
19,258
15,704
16,000
II-5 G2
II-5 L2
4.20
20,410
17,809

milk price must be higher for dairying to be profitable where land-buying is allowed to compete for the long-term credit. Dairying is not expanded as far where land-buying is allowed.

(3) Beef production is usually cut back to that which consumes the necessary forage production or to the level of production which can be produced with presently available housing and facilities. Land-buying is a more profitable use of long-term credit capacity than is expansion of beef housing. Hog production is also cut back to use only present facilities except at near the highest hog prices used in this study.

(4) Year-round labor-buying is not profitable in most situations. In some cases this activity is in the plans at a level of less than 200 hours per year. This activity produces a surplus of labor in some seasons.

(5) Farm incomes are increased by $200 to $4,000 per farm by allowing farm expansion. The amount depended on the prices of hogs and milk and the present set of farm resources.

No expansion of dairy facilities

A more conservative type of adjustment specification useful for the short-run or where expectations are not certain, is the case where the fixed plant is not altered. Though the plans which do not allow an increase in dairy facilities might be thought of as short-run adjustments, some time would be required for most farmers to achieve the technical efficiency in production used in this study. Therefore, the plans for fixed dairy housing can be described as more flexible in the sense of possible subsequent management decisions rather than immediate short-run adjustment potentialities.

Plans were derived for each farm, under the conditions of not allowing expansion of dairy facilities. The price maps for all ten farms given previously can be used for specifying plans where no expansion in dairy facilities is allowed. These price maps are valid up to any milk price where the number of cows equals the amount of dairy housing presently available (given in Appendix D). Four of the 10 farm types have no dairy facilities at present and would not have any dairy enterprise under the conditions of this section. The particular plans on the price maps which include the number of cows for which stanchion facilities are presently available are valid for all higher milk prices at the same hog prices. In all cases, the cows are planned to be fed at the highest of the three grain levels where the number of cows was at least as great as the capacity of present facilities. Thus, production per cow is at the highest of the three alternative levels. Technically, some expansion of dairy herd size beyond the stated limits of barn capacity would likely be possible by milking two or more barnfuls. Open shed space might be made available to the dairy enterprise instead of to the enterprise in which it is presently engaged. But, this possibility was not considered. The aggregate supply functions for grade B milk for the plans where hogs are priced at $14.10 and $15.60 per cwt., where no expansion of dairy facilities is allowed are shown in figures 58 and 59. These functions are shown for comparison with the functions for plans where expansion of stanchion facilities is allowed and also the functions corresponding to

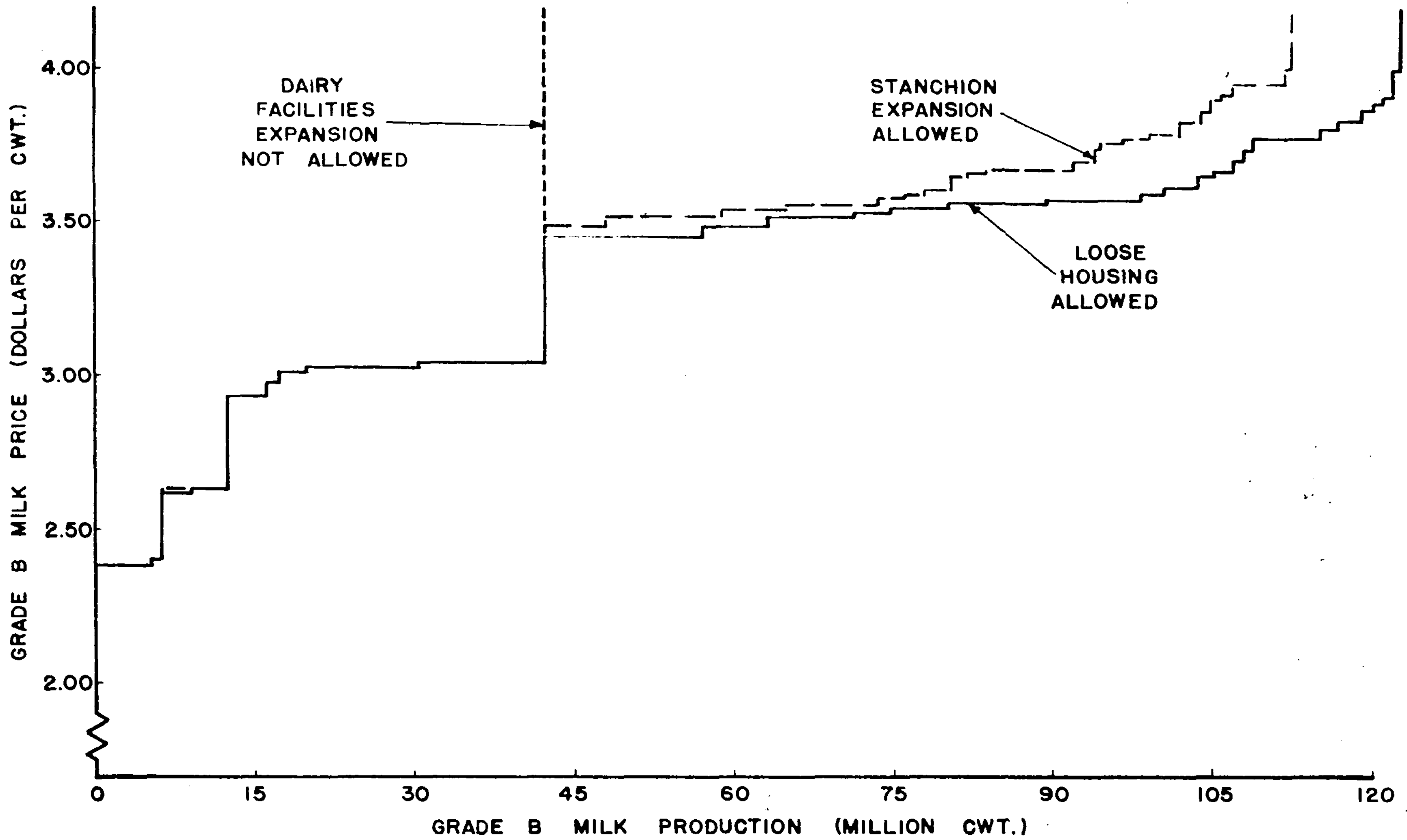


Figure 58. A comparison of aggregate supply functions for grade B milk where dairy facilities expansion is not allowed, increase in stanchion facilities is allowed and where loose housing-parlor milking facilities are allowed for hog price $14.10 per cwt.

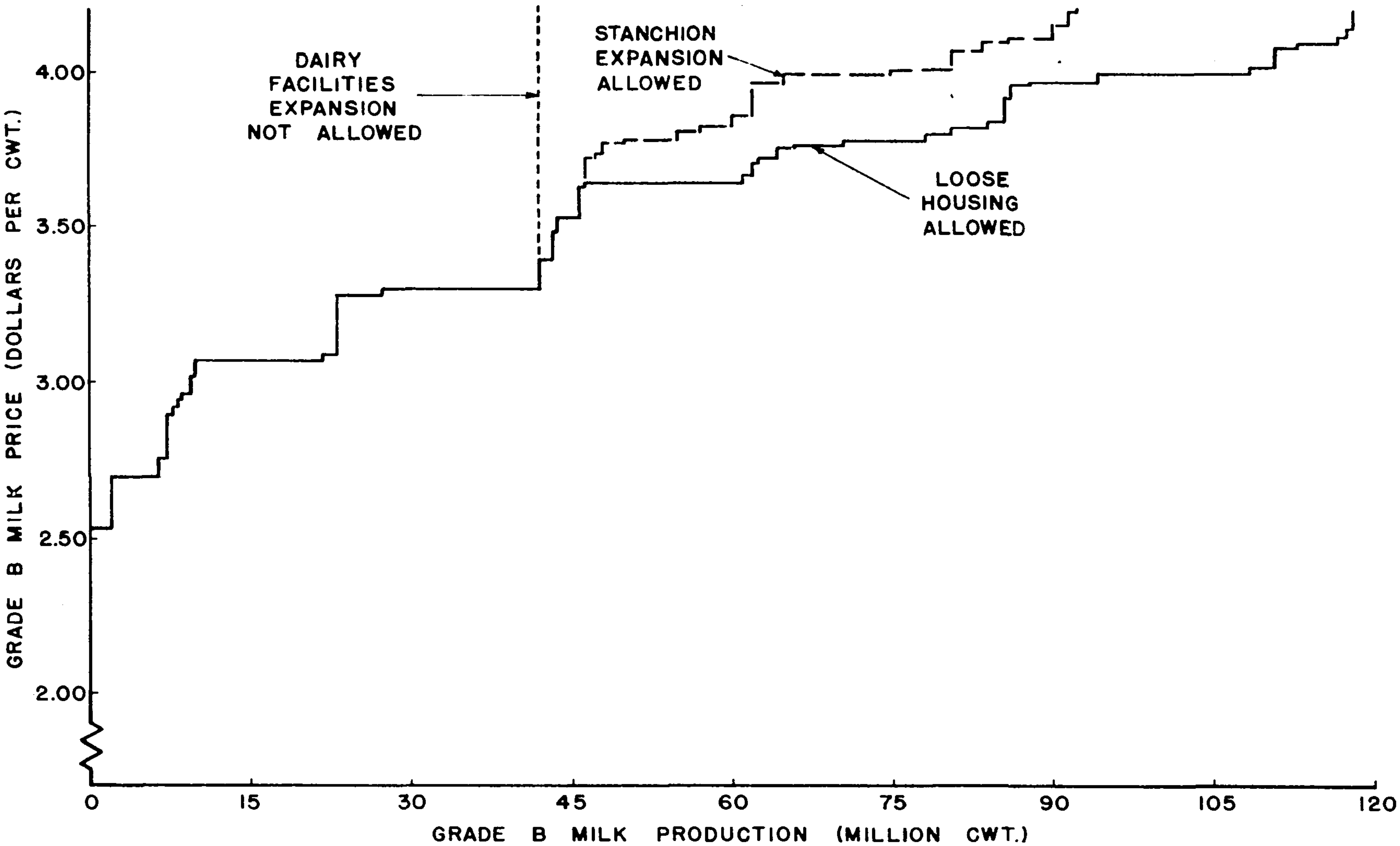


Figure 59. A comparison of aggregate supply functions for grade B milk where dairy facilities expansion is not allowed, increase in stanchion facilities is allowed and where loose housing-parlor milking facilities are allowed for hog price $15.60 per cwt.

optimum plans where parlor and loose-housing facilities are permitted. The supply functions for fixed dairy facilities shows maximum production to be only about one-third of that where building of new dairy facilities is allowed. The supply functions corresponding to fixed dairy facilities become perfectly inelastic (vertical) when the limit of present barn space is reached.

Dairy expansion limited to present technology

Plans for dairy enterprises in conventional stanchion barns where the stanchion facilities could be expanded were computed for all representative farms. These plans were computed for comparison to loose-housing techniques for profitability. Farm incomes and milk supplies would be reduced by not allowing parlor and loose-housing operations for large-scale dairies. The supply functions for grade B milk for conventional milking facilities are found in figures 58 and 59, as mentioned previously.

Farm plans and supply functions for the situations where expanded stanchion facilities are allowed, are identical to those given previously in the price maps and supply functions for milk prices up to milk prices where loose-housing is profitable. For milk prices high enough to warrant loose-housing, only slight increases in cow numbers would be attained by abandoning stanchion facilities and investing in parlor and loose-housing dairy facilities. For most plans, particularly those for farms which already have stanchion barn facilities the cow herds and present type of buildings should be expanded to the limits of resources as milk prices approach those where it would be profitable to convert to loose-housing.

Plans which allow increased stanchion facilities yield aggregate supply functions which show a large increase in supply over the case where expansion of dairy facilities is not allowed for the higher milk prices. In general, abandoning stanchion facilities to convert to parlor milking facilities would not be profitable except at high milk prices ($3.80 to $4.00) on large farms. The relative profitability of stanchion and parlor dairy systems for a few situations in optimal farm plans is shown in figure 60. The horizontal segments of the income curves in each part of figure 60 show the attainable net income where dairy cows are not allowed as an alternative. Therefore, plans which include dairy but have profit lower than that given by the horizontal segments are sub-optimum. Dairying, either in stanchion or parlor facilities raises farm income only as milk price and cow numbers become high enough to overcome the high labor and capital costs attached to the first few cows. Where dairy facilities are not available, building of a parlor and loose-housing system of dairy facilities is the most profitable method of introducing dairying where sufficient farm resources are available to invest in, feed and care for a large-size dairy herd. But, this action would only be profitable at relatively high milk prices, especially for those farmers with only a market for manufacturing grade milk. The possibilities of an individual farmer obtaining a grade A milk market on the condition of investment in a milking parlor might be sufficient inducement to make the investment if the farmer had sufficient certainty of expectations with regard to the price for, and the amount of milk which

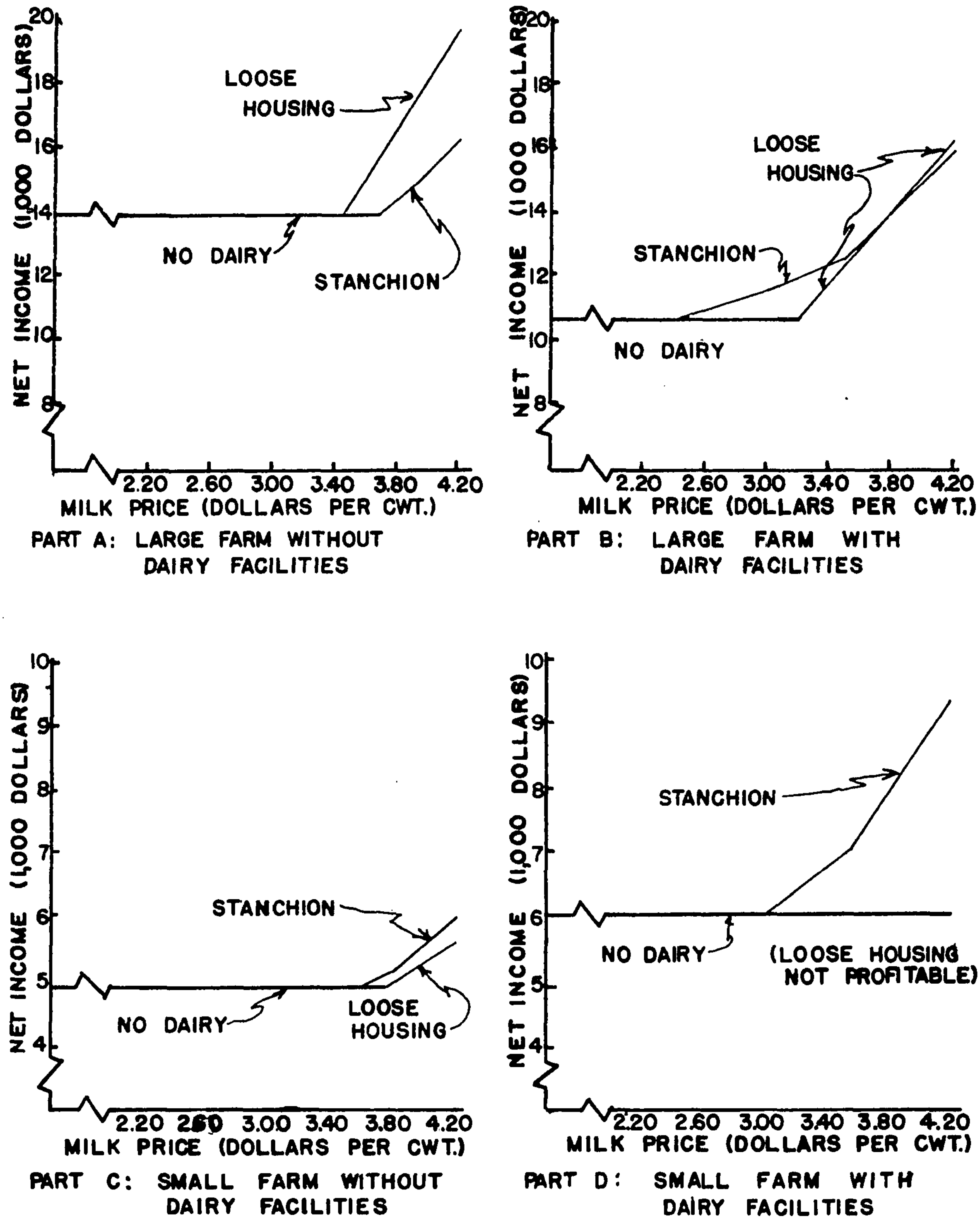


Figure 60. A comparison of net incomes for stanchion and parlor milking facilities from four selected farms in Soil Area I with hog prices set at $14.10 per cwt.

he could market.

It would appear the use of present facilities is the only dairy system which would likely pay for small farms. Even continuing use of present facilities would not be profitable unless milk price could be expected to be above about $3.00 per cwt. On the small farms, feed, capital and labor are not available in sufficient quantities to support enough dairy cows to spread fixed labor and capital costs over a large enough number of cows to make parlor and loose-housing facilities profitable.

ADJUSTMENT TRENDS AND PROSPECTS

Over the past several years in which farm incomes have declined relative to non-farm incomes, several adjustments have been occurring in agriculture. Size of farms has been increasing, enterprises have been added or dropped, or increased or decreased. Young people have not been so actively seeking farm employment and some farmers have sought off-farm employment to supplement earnings in agriculture.

Increasing the farm size has been one of the most widely used methods to increase farm income. Many farmers have bid up land prices for land near their farm which was suitable for adding to their present holdings. Usually the farmers' present labor and machinery complement is sufficient to absorb the additional land without extensive additional labor and machinery purchases. The trend of increasing farm size in the northeastern Iowa has been rather steady since the mid 1930's. The average size of farm increased still more rapidly in the period between 1954 and 1959. This latter rate of size increase was approximately 1.35 percent per year. The growth in farm size is shown in figure 61. The data are from the Census of Agriculture (66, 67, 68, 69 and 70). If one extrapolates the increasing rate of growth since 1945 a doubling in farm size could be predicted over the next 20 years. There is, however, no assurance that farm size will continue to increase at an increasing rate. At any rate, farm size is being increased at a fairly rapid rate.

Size of farms found in the sample depended to some extent on the age of the farm operator. This relationship is shown in table 19. In general, it appears that the older operators have smaller farms, except

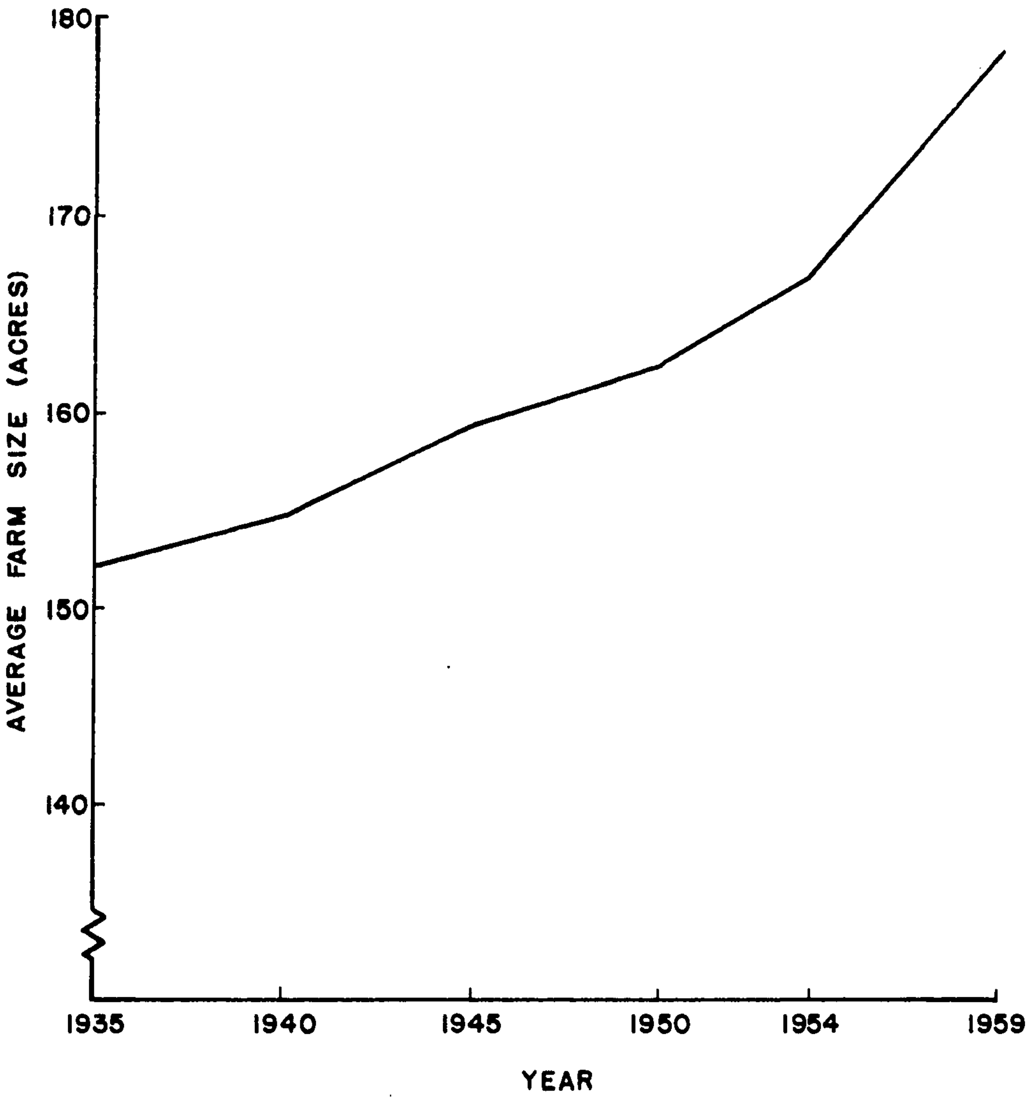


Figure 61. Size of farms in northeastern Iowa from 1935 to 1959

Table 19. Age distribution of farm operators by size of farm from the sample of farms of northeastern Iowa

	Acres of cropland				
Age of operator	0-99	100-199	200-299	300 or more	Total
	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators
18-29	4	16	1	0	21
30-39	9	32	18	1	60
40-49	14	26	3	5	48
50-59	21	20	7	3	51
60-69	7	8	2	0	17
70-79	2	1	2	0	5
80-82	1	0	0	0	1
Age not given	2	0	1	0	3
Total	60	103	34	9	206

some of the older operators who are in partnership with or have some other operating arrangements with younger family members have some of the largest farms.

Farms in the sample survey had been adding land to the farm. Of the 206 farms in the sample, 35 farms reported land added by renting or buying in the previous ten years or since the present operator came on the farm, whichever was the least number of years. Eighty-seven of the 206 farm operators had been on their farms for less than ten years. Therefore, the 35 farms, or about one-sixth of the total, had been enlarged in an average period of somewhat less than 10 years.

The average acreage added among the 35 farms reporting addition of land was 105 acres. Acreage added by buying or renting is shown in table 20. Forty acres was the amount most frequently added (7 cases) and 80 acres was next in frequency of occurrence with six cases. Larger additions were usually not in even fractions of sections from the land survey. Considering that over one-half of the additions to land in the farm have been more than 100 acres, it appears that farm size additions are large. In many cases, whole farms are being absorbed by others.

Farm enterprises have been changed in an effort to better utilize resources to meet income goals. Increasing age of some farmers has also caused them to drop some enterprises with heavy labor requirements. The data of table 21 show that dairying has been most frequently added to or dropped from the farm business. Approximately one-fifth of the farmers

Table 20. Distribution of acres added to sampled farms by renting or buying in the past ten years or since present operator came on farm

	Number of farms		
Acres added to farm	Renting	Buying	Total
20-59	6	3	9
60-99	3	5	8
100-139	4	3	7
140-179	2	5	7
180-219	0	2	2
220-259	1	1	2
Total	16	19	35

Table 21. Number of farmers making specified major farm enterprise changes in the last ten years or since operator came on farm by type of farm[a]

Farm enterprise change	Grade A dairy farms	Small non-dairy farms	Large non-dairy farms	Small dairy farms	Large dairy farms	Total
	Type of farm					
	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers
Drop dairy		8	12	12	11	43
Add dairy	6			4	8	18
Drop hogs		1	2	5	4	12
Add hogs	1			5	3	9
Drop beef-feeding						0
Add beef-feeding	1		2		1	4
Other changes[b]		2	2	4	1	9
No changes reported	4	6	9	54	38	111
Total	12	17	27	84	66	206

[a]Only one change which was thought to be the most significant change was listed for each farm. In some cases more than one change occurred.

[b]Includes the addition or dropping of a few other livestock enterprises such as poultry or sheep and some changes in cropping practices.

contacted had dropped dairying in the previous ten years, or, if they had been on the farm less than ten years, since they began operating the farm. It is notable that one-half of the grade A milk producers had begun dairying within the last ten years. Nearly half of the farms which reported having no dairy facilities had dropped dairying within the past ten years. None of the farmers reported dropping the beef-feeding enterprise, although some farmers feed in some years and not in others. They feed when their profit prospects appear good and do not when they are pessimistic. The youngest group of farmers had made only a few changes in enterprises (table 22). They had only been operating their farms for a short while and had made few changes in farm organization since beginning the farming operation. Approximately one-half the farmers between 30 and 59 years reported no changes, but those over 50 who made changes almost always dropped enterprises rather than some adding and some dropping as with younger farmers. Many of the older farmers had dropped dairying.

Age and education of the farm operators are important determinants of the adjustments that farm operators are able and willing to make. Younger farmers, especially those with good educational backgrounds, are in an advantageous position to make either on- or off-farm adjustments to meet the price squeeze and to maintain or improve family incomes. Ages and years of education of farm operators in the sample are compared in table 23. Lack of adequate education and the lack of alternatives as well as inertia and the firm roots in farming and in the community seem to be major deterrents to older farmers making more profitable changes in farm organization or in taking advantage of off-farm opportunities. Less than half of the farm operators had completed high school. Lack of education was more prevalent among older farmers than among younger operators however, so that the amount of education is improving over time. In addition, younger family members associated with the family farm are achieving higher levels of education than their parents. This increase in educational attainment appears to have promise in alleviating the adjustment problems. Much more improvement in education is needed.

Table 22. Number of farmers making specified major farm enterprise changes in past ten years or since beginning operation by age of farm operator

Farm enterprise change	Age of operator 18-29	30-39	40-49	50-59	60-69	70-79	80-89	Age not given	Total
	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers	No. of farmers
Drop dairy	1	12	8	12	9			1	43
Add dairy	1	8	7		1			1	18
Drop hogs		1	4	6		1			12
Add hogs		4	3		1				9
Drop beef-feeding									0
Add beef-feeding		1	1	2					4
Other changes		1	2	5	1				9
No changes reported	19	33	23	25	5	4	1	1	111
Total	21	60	48	51	17	5	1	3	206

Table 23. Years of education by age of farm operator

Years of education	Age of operator							
	18-29	30-39	40-49	50-59	60-69	70-82	Age not given	Total
	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators	No. of farm operators
4-7		3	3	3	1	2		12
8	7	19	19	22	8	3		78
9-11	1	5	3	8	4			21
12	12	27	18	14	3			74
13-15	1	3	1			1		6
16			1					1
Not reported		3	3	4	1		3	14
Total	21	60	48	51	17	6	3	206

Off-farm employment is sometimes used to supplement family income or to aid in accumulating capital to expand the farm business. Thirty-three of the 206 farm operators reported some off-farm work. Farm custom work was not included in the analysis of non-farm jobs. Northeast Iowa is not heavily industrialized so that industrial jobs are scarce in most areas. In local areas where factory work is available, incidence of off-farm work is much higher than in the rest of northeast Iowa. Type of skill involved in the off-farm jobs reported for seasonal and year-round employment is summarized in table 24. Higher order skills seem to be associated with year-round employment. Seasonal workers are forced to take any jobs available.

Due to the shortage of non-farm jobs approximately one-half of those

Table 24. Type of skill by seasonality of employment for off-farm work

Type of skill	Seasonality of employment		
	Seasonal	Year-round	Total
	No. of farm operators	No. of farm operators	No. of farm operators
Manager or self-employed	2	3	5
Clerical or office work	0	2	2
Skilled trade or craft	4	2	6
Skilled production line	1	2	3
Semi-skilled worker	10	4	14
Not reported	2	1	3
Total	19	14	33

working off-farm were forced to travel ten or more miles to work. The distance to work ranged up to nearly fifty miles which was traveled daily year around.

Hourly take home wages on off-farm jobs ranged from just under $1.00 to $3.00 per hour. The modal wage was $2.00 per hour. Total take home wages for the year from non-farm work ranged from just a few dollars to $5100. The earnings reported are net earnings in the case of self-employed persons having business expenses. Table 25 gives the distribution of total take home wages for year-round and seasonal workers. Year-round employment did not always mean full-time work. Some farm operators had

Table 25. Total take home wages (1958) for off-farm work by seasonality of employment

Total take home wages (1958)	Seasonality of employment		
	Seasonal	Year-round	Total
Dollars	No. of farm operators	No. of farm operators	No. of farm operators
0-999	11	0	11
1000-1999	4	2	6
2000-2999	1	1	2
3000-3999	0	3	3
4000-4999	0	1	1
5000-5199	1	1	2
Not reported	2	6	8
Total	19	14	33

part-time year-round jobs. Though off-farm wages were higher for year-round work, the seasonally employed farmers frequently had working schedules which fit in conveniently with peak work loads and slack periods in farm work.

The relationship of age to off-farm work is shown in table 26. It

Table 26. Number of farm operators by seasonality of off-farm work by age

Age of operator	Off-farm work None	Seasonal	Year-round	Total
18-19		1		1
20-29	16	2	2	20
30-39	50	8	2	60
40-49	40	4	4	48
50-59	43	4	4	51
60-69	17			17
70-79	4		1	5
80-82	1			1
Not reported	2		1	3
Total	173	19	14	206

appears that there is a tendency for younger farm operators to take seasonal employment to increase family income or to accumulate capital while older farmers, particularly those over 60 have no off-farm jobs.

Size of farm was inversely related to the amount earned from off-farm sources, as might be expected (table 27). There is very little off-farm work being done by farm operators with farms of more than 200 acres of cropland. Some of the off-farm wages reported from the larger farms and for older farm operators is brought about by owner-operators

Table 27. Number of farm operators by take home wages by size of farm

Take home wages from off-farm work (1958)	Size of farm (cropland acres)				
	0-99	100-199	200-299	300 and over	Total
None	44	90	31	8	173
0-999	2	6	2	1	11
1000-1999	2	3	1		6
2000-2999	2				2
3000-3999	2	1			3
4000-4999	1				1
5000-5200	1	1			2
Not reported	6	2			8
Total	60	103	34	9	206

working off-farm seasonally or year-round, but maintaining ownership and managerial supervision. Much of the farm labor is being performed by other family members.

Security of tenure and the extent to which capital is invested in fixed assets are important factors in determining the possibilities of leaving agriculture or in obtaining larger farms or increasing other enterprises. Tenants are able to evaluate alternatives within and outside of agriculture at the expiration of each leasing period, or, ordinarily at the end of each year. They would likely, however, suffer a loss on their machinery and livestock inventories if they leave agriculture. Owners of farms may have fewer opportunities to liquidate their assets in farming. This is especially true when farm product prices are depressed so that the land market is also depressed. In the recent past, however, the land market has been supported at a fairly high level by farm consolidation purchases. The price of land has been bid up because the marginal value product from land for farm expansion has been high (relative to price of the land) in comparison to the marginal value product from other resources with respect to their prices.

The relationship between farmers' ages and tenure arrangement to the length of time they expect to stay on the farm is shown in table 28. Only 36 of the 206 farm operators had definite plans about how long they would continue to operate their farms. Most of those who had definite plans were planning on retirement and social security payments as a basis for ceasing operation of their farm. A few tenants were planning to change farms in one or a few years. Only about one-half of the farm operators 60 years old or more had definite plans on when they would quit operating their present farm and only about one-fourth of those in their fifties had definite plans. Very few younger farmers had made plans to quit operating. Undoubtedly many of those who did not know how long they would operate their farm can be expected to make plans as time passes and as opportunities arise and as their farm earnings change. Some others will be forced to leave by expiration of leases and other factors. Most of those who had definite plans to leave their farms were planning to do so within ten years which is evidence that as time passes others will make plans. Approximately one-third of the farm operators are tenants, so that farm operator transfers will likely be more frequent than is indicated by table 28.

It appears that opportunities to enter agriculture are very limited for those who are not sons of farm owners. Table 29 gives the expected

Table 28. Relation of age of farm operator and years planning to operate present farm to tenure on farm

Age	Years plan to operate farm	Tenure: Owner-operator	Part owners	Crop and livestock share leases	Other leases	Total
		No. of farmers	No. of farmers	No. of farmers	No.of farmers	No. of farmers
18-49	1-5	1		2	4	7
	6-10			2		2
	11-15				1	1
	16-20	3	1		1	5
	Over 20			1		1
	Not known	50	10	32	21	113
50-59	1-5	1	1			2
	6-10	7	1		1	9
	11-15	1				1
	Not known	29	8	2		39
60-69	1-5	5	1			6
	6-10	1				1
	Not known	8	1	1		10
70-82	1-5					
	6-10	1				1
	Not known	4		1		5
Not known	Not known	3				3
All ages	1-5	7	2	2	4	15
	6-10	9	1	2	1	13
	11-15	1			1	2
	16-20	3	1		1	5
	Over 20			1		1
	Not known	94	19	36	21	170
Total		114	23	41	28	206

Table 29. Relation of age to plans for transfer of farm where an apparent successor is and is not evident[a]

Method of transfer	Age: Under 40, Successor	Under 40, No apparent successor	40-54, Successor	40-54, No apparent successor	55-64, Successor	55-64, No apparent successor	65 or over, Successor	65 or over, No apparent successor	Not given, Successor	Not given, No apparent successor	Total
	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners	No. of farm owners
Sale		2		10	1	1					14
Lease to tenant		2	2	5	3	7	1	1			21
Transfer to heir		12	14	8	6	5	6	2	1		54
No definite plans	1	13	6	13	4	9			1	1	48
Total	1	29	22	36	14	22	7	3	2	1	137

[a]An apparent successor is defined as a son 14 years old or more who has not made a definite commitment to an occupation other than the operator's farm.

disposition of the farms for the 137 owners and part owners. The table shows that of the 89 who have definite plans for disposing of their farm, only 35 plan to sell the farms or lease to a tenant. Some of these sales and leases were indicated to likely be made to family members. It appears that many of the farm transfers to heirs will be made to non-farm people, or daughters, or that some sons of farm operators may decide to farm upon inheriting a farm. In many cases there is no apparent successor in the farm operation, even though the operator plans to transfer the farm to an heir.

Farm consolidation and movement from the farm is likely to occur mostly among younger farmers. New entrants into farming will likely diminish. In investigating the future demand for farm operating vacancies, the present occupations and expected permanent occupations of farmers' sons 14 years or more old were tabulated in table 30 and table 31. Of those sons reported, 29 percent were in school, 18 percent were on the operator's farm, 8 percent were on their own farm and 45 percent were employed in non-farm jobs of various kinds. Tenants' sons had a higher tendency to be in non-farm occupations. Only one son of a tenant farmer was planning to be a farmer as a permanent occupation. Of the 40 sons of farm operators who are 14 years old or more and still in school, only 4 definitely are expecting to farm. However, many of the 23 who have made no definite plans may enter farming. Thirteen of the 40 students have made definite plans to enter non-farm vocations. Forty of the 99 sons of farm operators who have made plans on a future occupation have decided to be farmers. The 11 sons who presently have farms of their own are

Table 30. Current occupations of farm operators' sons who are more than 14 years old

Current occupation	Sons of farm owners and part owners 50 or more years old	Sons of farm owners and part owners less than 50 years old	Sons of tenants	Total
	No. of sons	No. of sons	No. of sons	No. of sons
School	16	17	1	40
Operator's farm	23	1	1	25
Own farm	11	0	0	11
Manufacturing	16	3	6	25
Service occupations	13	2	5	20
Military	7	2	0	9
Professional	7	0	1	8
Not reported	1	3	0	4
Total	94	28	20	142

expecting to continue operation of their own farm. From those who have definitely decided to farm, no more than the 12 sons who have not made arrangements on a particular farm are expected to be seeking farming opportunities away from the operator's farm. In fact some of these 12 may operate the family farm. The 43 sons who are undecided about future occupation represent a substantial, flexible labor pool, which could increase adjustment problems by their seeking farm opportunities or could benefit materially from increased non-farm job opportunities and information and help in selecting a permanent vocation.

Judging from the past experience, very few farm operators are apt to come from non-farm jobs to farming. Of the 206 farm operators in the

Table 31. Expected permanent occupations of farm operators' sons who are more than 14 years old

Expected permanent	Sons of farm owners and part owners 50 or more years old	Sons of farm owners and part owners less than 50 years old	Sons of tenants	Total
	No. of sons	No. of sons	No. of sons	No. of sons
Operator's farm	17	0	0	17
Own farm (not operator's)	11	0	0	11
Farm (operator's or other)[a]	7	4	1	12
Manufacturing	13	3	5	21
Service occupations	9	2	6	17
Military	1	0	0	1
Non-farm (exact occupation not decided)	2	3	0	5
Professional	10	3	2	15
Not reported or undecided	24	13	6	43
Total	94	28	20	142

[a]No agreements or arrangements had been made to obtain control of any particular farm.

sample survey 119 had been on their present farm at least ten years. Of the rest, 82 percent had come from operating other farms or as hired farm workers or as unpaid family workers on farms. Only about seven percent of the farm operators had come from non-farm jobs in the past ten years. Many of these maintain their non-farm jobs and others have only small farms for semi-retirement residences.

The situation appears to be such that about one half of the farms are fairly large and their operators are adjusting to the changes required to have fairly good prospects for the future. Some of the other farmers are also making changes, but have considerable progress to make before adequately meeting the challenge of the income squeeze. It also seems that as the farm operators are becoming older and many are retiring, the farm population will continue to decline. Farm youth are, to a greater extent than ever, seeking non-farm jobs. The farm youth and younger farm operators are also acquiring more education than attained by their elders, so that all of these forces will accelerate the adjustment processes needed.

SUMMARY AND CONCLUSIONS

There were two main purposes for this study. One was to derive optimal farm organizations for farms representative of all farms in northeastern Iowa. These farm plans were for varied price levels for milk and hogs. The aggregate effects of these individual farm adjustments were studied to relate the individual firm and market supply. The second main purpose for the study was to determine the characteristics of the normative supply functions. Thus, in this study, the aggregate effects of farmers' optimal responses to price changes were accounted for, as far as the region of this study applies. In the usual farm adjustments, which are often production increasing (a means of getting more production from the same resources to meet the cost-price squeeze), one round of adjustments frequently calls for another.

In this study, farm plans were derived by parametric linear programming for each of 10 representative farms. The technical coefficients used in developing these farm plans were projections to 1965 and reflected a fairly high level of management which was thought to be attainable by farmers making optimal adjustments. Prices, too, were projections to 1965, except prices for milk and hogs were varied so that supply functions could be obtained from the optimal farm plans. Normative supply functions are comprised of optimal levels of production for the various price levels.

The farm plans computed have more specialization and intensification of production than is found currently on farms in northeastern Iowa. Crop sequences for all farms and at all price ranges considered are fertilized at the recommended rates. Grain production is very heavy, except where milk prices are high enough to justify large dairy herds. There, where most farm resources are devoted to dairying, crops include about one-half rotation hay and pasture. Corn silage is harvested in addition to the hay to meet forage requirements.

Livestock enterprises in the plans are also more specialized and intensive than is currently the case. Usually, the plans emphasize one most profitable livestock enterprise, or, in some cases complimentarities in production account for two or three livestock enterprises being in each optimal plan. Farm plans for the ten representative farms have beef-feeding and cash-cropping enterprises for low milk and hog prices. On many of the farms the number of feeder cattle in the plans is about one per acre of cropland. On three of the ten farms, where operating capital is in relatively short supply, cash-cropping is the main enterprise for low milk and hog prices. At high milk prices and low hog prices, most of the optimal plans include only dairying and crop enterprises that produce substantial forage. Dairy enterprises range up to 78 cows in parlor milking facilities on the larger of the two grade A dairy farms. Smaller farms do not have enough feed, capital or labor to support very large dairy herds, although it would be profitable to have substantial increases from present herd sizes if milk price was very high. Where both milk and hog prices are high, both hogs and dairy cows are usually in the farm plans. Hog production alone, or mainly hogs with a few beef cows to use excess forage, is most profitable where hog prices are high and milk prices low.

At present, most of the farms have several livestock enterprises, many of which involve only a few head. The reasons for the wide variations in present livestock enterprises among farms are the differences in resources available, different price expectations and personal preferences and abilities.

The supply functions and cross-supply functions for milk, hogs and beef derived from the optimal farm plans have high elasticities. The quantities of the various products depend heavily on the price of the same product and on prices for competitive products. Cross-elasticities of supply for livestock products are nearly as high as supply elasticities relating quantity and price of the same product. At prices near the projected prices for grade B milk, grade A milk and hogs, the following ranges of elasticities of supply were obtained: grade B milk, 3.82 to 17.50; grade A milk, 0.78 to 3.29; hogs, 5.77 to 38.15. The projected grade B milk and hog prices ($3.00 per cwt. for milk and $14.10 per cwt. for hogs) proved to be in price ranges where alternating products compete closely for available resources. The competitive nature of various enterprises cause high supply elasticities. The projected price for grade A milk ($4.00 per cwt.) is sufficiently high that few enterprises could compete with dairying at that price for the resources of farms capable of producing grade A milk. The cross-elasticities of supply for grade B milk production with respect to hog prices range from +0.22 to -19.80 at prices near the 1965 projected prices. The positive cross-elasticity is related to the price increased for milk diverting forage from feeder cattle to dairy cows so that excess grain can be used for hogs. It also is related to price increases for hogs which divert grain from feeder cattle so that excess forage can be used for dairy cows. In general, however, dairy and hogs are competitors for resources. Cross-elasticities of supply of grade A milk with respect to hog price range from 0 to -3.02. For most prices near those projected for hogs and grade A milk, hogs are not sufficiently profitable to compete for resources. Cross-elasticities of zero result. The cross-elasticities for hog production with respect to milk price at prices near the projected price levels range from -0.52 to -6.31. These values again indicate that hogs and dairy cows are competitive for resources. Cross-elasticities of supply for aggregate beef production with respect to hog prices range from -2.08 to -9.68 for milk and hog prices near the projected levels. The cross-elasticities for beef production with respect to milk prices range from -0.12 to -11.11 for prices near those which were projected. These cross elasticities for beef production and the production surface (figure 42) show that there is a strong relationship between optimal levels of beef production and milk and hog prices.

Since aggregate beef production was so great in the plans computed, and since the beef-feeding margins used in computing the plans were somewhat higher than those which have prevailed in recent years, a few plans were computed using reduced beef-feeding margins. These reduced margins were equal to the net "on-the-farm" margins for the past two complete cattle cycles. In these few farm plans it was found that the lower feeding margins substantially reduce optimal levels of beef production, usually reduce the minimum milk and hog prices at which milk and hog production become profitable and reduce farm incomes in milk and hog price ranges where beef-feeding would be profitable at the higher feeding margins.

One of the assumptions used in this study was to hold farm size fixed. This assumption was used to facilitate aggregation of results of individual farm programs. Also, there is no established market place for land. Availability of land depends more upon fortuitous circumstances than on any schedules of supply and demand. It is believed, however, that further attempts to study interregional competition and regional agricultural adjustments by aggregating individual farm adjustments should include some provision for farm expansion. Four main factors justify this conclusion:

(1) The rate of farm consolidation is very rapid, and increasing, in the area of this study and in most other agricultural areas in the United States.

(2) The results of this study, as well as many other linear programming and budgeting studies of farm organization in the Corn Belt and Lake States show that cropping enterprises have highest priority on farm resources. Therefore, it seems logical to allow increased farm size and expanded crop enterprises to maximize profits in farm plans.

(3) The few farm plans in which farm size was flexible in this study, show very substantial increases in farm incomes from increased farm size.

(4) Marginal value products for cropland are high (See Appendix E) in plans where farm size is fixed. These MVP's range from approximately $23 to $80 per acre, depending on the prices of milk and hogs and the present set of resources.

There is no evidence that expanded farm sizes would increase net incomes for a whole area. But, some farmers could leave agriculture to find other employment. Those farm families remaining in agriculture would have higher incomes.

There are likely several ways to handle farm adjustment studies which provide for farm expansion and still allow aggregation of production quantities. Two linear programming models are possibilities. One method would be to compute optimum production plans for regions or areas where all farm resources would be consolidated to a regional pool. This type model would have the disadvantage of not specifying farm plans for the different kinds of farms within the region. Another possible model would involve putting several sets of individual farm restrictions and sets of activities applicable to each farm into an area linear programming model but solve the model with respect to only the area objective function. In this type model, interfarm transfer of resources including land could be accomplished. Total land and other transferrable resources, as well as area production of the different products, would be accounted for in this type area model. Individual farm organizations would also be specified.

It is believed that this study, using the individual farm planning approach, does provide good guides for agricultural adjustment and indications of the characteristics of the supply functions under the assumption of optimal adjustments. The study also should be useful in specifying the actual relationships which affect supply schedules of farm commodities. This study represents one of the first attempts to relate individual farm responses to aggregate supplies in the study of interregional competition and competitive position of farm types.

Farm adjustments are currently taking place at a rather rapid rate in northeastern Iowa. About one-sixth of the farms in the survey had been enlarged in the last 10 years, or since the operator had come on the farm. Along with the increase in farm size, there have been many enterprise changes in the past few years. Approximately one-fifth of all the farms in the survey reported having dropped the dairy enterprise. Nearly half of those reporting no dairy facilities at the present time had previously included dairying in their farming operations. However, about half as many as had dropped dairying have added a dairy enterprise, so that the net change is that in 1959 about 70 percent of the farms had dairy cows and in about 1950-52 there were milk cows on about 82 percent of the farms.

Along with the tendency for farms to consolidate, younger farm family members are obtaining more education and higher-order skills for better employment opportunities. Too, younger farm operators are attaining more formal education which should speed farm adjustment processes.

There appears to be a very limited number of farm opportunities for individuals who will not carry out operation of their own family's farm. Farmers' sons in general, except for those who can remain on the family farm, are seeking and will need to continue to seek non-farm employment. Only 40 percent of farmers' sons in the survey who were over 14 and had decided on a permanent occupation had decided to farm. The other 60 percent were either already engaged in, or planned to enter, jobs of a manufacturing, service or professional nature. A sizable number had not yet decided on an occupation.

In summary, it appears that farm adjustments are being made at a fairly rapid rate. But, several types of opportunities are present for speeding the adjustment process. First, even though educational attainment is increasing, increased emphasis should be placed on each individual acquiring all of the education and skills of which he is capable. Second, there is a substantial opportunity for attempting to bring alternative employment opportunities to those in northeastern Iowa who are not needed in farming, because of the opportunity to maintain community and family ties while engaged in non-farm work. Alternatively, or at the same time, there should be increased emphasis on employment information for other areas.

Thus, though changes are occurring, there seems to be ample opportunity to encourage efficient farm organizations, promote further opportunities for off-farm work and to design and implement government and self-help programs which promote efficiency and economic welfare.

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APPENDIX A

The crop yield estimates and fertilizer recommendations in the tables in this appendix were taken from Shrader et al. (41). The composite yield estimates and fertilizer requirements are weighted averages from the estimates for each of the soil types, and were used in constructing the programming coefficients. The soil types, slopes, and the data for computing percentage of total area cropland for each soil type are from the Soil Survey Reports (7, 8, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53 and 56).

Area I is generally called the Carrington or Carrington-Clyde soil area. More recently it has been referred to as the Kenyon or Kenyon-Floyd-Clyde soil area (55). It is composed of the following counties: Worth, Mitchell, Howard, Floyd, Chickasaw, Butler, Bremer, Black Hawk, Buchanan, Delaware and Fayette.

Area II is generally the Fayette soil area. It is composed of the following counties: Winneshiek, Allamakee, Clayton, Dubuque, Jones and Jackson.

The recommended fertilizer rate is designated F_1. Little or no commercial fertilizer application is designated as fertilizer rate F_o. The symbols N-P-K refer to available nutrients of nitrogen (N), phosphate (P_2O_5) and potassium (K_2O), respectively.

Table 32. Crop yield estimates for Area I by crop sequence for the recommended (F_1) fertilizer rate

Crop sequence	Soil type / % slope / % of area	Carrington 2-5 59.5	Gresco 2-5 6.1	Clarion 2-5 1.3	Clyde 1-2 16.3	Floyd 1-3 3.9	Tama 2-5, 5-9 7.5	Fayette 5-9 5.4	Composite
corn		75	60	72	72	75	83	72	74.0
oats		50	40	52	48	53	52	44	49.0
$meadow_1$		3.2	2.8	3.0	3.0	3.2	3.4	2.8	3.1
$meadow_2$		3.2	2.8	3.0	3.0	3.2	3.4	2.8	3.1
$corn_1$		75	60	72	72	75	83	72	74.0
$corn_2$		73	59	70	70	73	81	70	72.1
oats		50	40	52	48	53	52	44	49.0
meadow		3.2	2.8	3.0	3.0	3.2	3.4	2.8	3.1
continuous corn		71	57	68	68	71	79	68	70.1

Table 33. Crop yield estimates for Area I by crop sequence for the F_o fertilizer rate where no commercial fertilizer is applied

Crop sequence	Soil type % slope % of area	Carrington 2-5 59.5	Cresco 2-5 6.1	Clarion 2-5 1.3	Clyde 1-2 16.3	Floyd 1-3 3.9	Tama 2-5, 5-9 7.5	Fayette 5-9 5.4	Composite
corn		52	40	60	50	52	58	54	51.6
oats		36	30	36	36	38	37	30	35.5
$meadow_1$		2.0	1.8	2.4	2.2	2.4	2.7	2.0	2.1
$meadow_2$		2.0	1.8	2.4	2.2	2.4	2.7	2.0	2.1
$corn_1$		48	37	54	46	48	55	46	47.5
$corn_2$		38	26	44	36	38	45	36	37.4
oats		36	30	36	36	38	37	30	35.5
meadow		2.0	1.8	2.4	2.2	2.4	2.7	2.0	2.1
continuous corn		26	18	30	27	27	29	22	25.8

Table 34. Fertilizer requirement estimates, in pounds of available nutrients, for Area I by crop sequence for recommended (F_1) fertilizer rate

Crop sequence	Soil type	Carrington	Cresco	Clarion	Clyde	Floyd	Tama	Fayette	Composite
	% slope	2-5	2-5	2-5	1-2	1-3	2-5, 5-9	5-9	
	% of area	59.5	6.1	1.3	16.3	3.9	7.5	5.4	
		N-P-K	N-P-K	N-P-K	N-P-K	N-P-K	N-P-K	N-P-K	N-P-K
corn		10-55-40	10-60-50	10-60-20	10-45-60	10-55-50	10-30-15	10-25-10	10-50-41
oats		0-30-30	0-40-40	0-50-10	0-25-45	0-30-40	0-30-0	0-10-0	0-29-29
$meadow_1$		0	0	0	0	0	0	0	0
$meadow_2$		0	0	0	0	0	0	0	0
$corn_1$		10-55-40	20-60-50	25-60-20	10-45-60	10-55-50	10-30-15	25-25-10	12-50-41
$corn_2$		30-30-30	35-35-35	45-40-20	40-25-40	25-35-40	30-10-0	55-25-10	33-32-30
oats		0-50-30	0-55-40	0-50-0	0-40-45	0-50-50	0-30-0	0-20-0	0-46-30
meadow		0	0	0	0	0	0	0	0
continuous corn		65-55-40	80-60-50	95-60-20	55-45-60	55-53-50	60-30-15	110-25-15	66-50-41

Table 35. Crop yield estimates for Area II by crop sequence for the recommended (F_1) fertilizer rate

Crop sequence	Soil type % slope % of area	Carrington 2-5 12.0	Tama 2-9 27.5	Fayette 5-9 60.5	Composite
corn		75	83	72	75.4
oats		50	52	44	46.9
$meadow_1$		3.2	3.4	2.8	3.0
$meadow_2$		3.2	3.4	2.8	3.0
$corn_1$		75	83	72	75.4
$corn_2$		73	81	70	73.4
oats		50	52	44	46.9
meadow		3.2	3.4	2.8	3.0
continuous corn		71	79	68	71.4

Table 36. Crop yield estimates for Area II by crop sequence for the F_o fertilizer rate where no commercial fertilizer is applied

Crop sequence	Soil type % slope % of area	Carrington 2-5 12.0	Tama 2-9 27.5	Fayette 5-9 60.5	Composite
corn		52	58	54	54.9
oats		36	37	30	32.6
$meadow_1$		2.0	2.7	2.0	2.2
$meadow_2$		2.0	2.7	2.0	2.2
$corn_1$		48	55	46	48.7
$corn_2$		38	45	36	38.7
oats		36	37	30	32.6
meadow		2.0	2.7	2.0	2.2
continuous corn		26	29	22	24.4

Table 37. Fertilizer requirement estimates, in pounds of available nutrients, for Area II by crop sequence for the recommended (F_1) fertilizer rate

Crop sequence	Soil type % slope % of area	Carrington 2-5 12.0 N-P-K	Tama 2-9 27.5 N-P-K	Fayette 5-9 60.5 N-P-K	Composite N-P-K
corn		10-55-40	10-30-15	10-25-10	10-30-15
oats		0-30-30	0-30-0	0-10-0	0-18-4
$meadow_1$		0	0	0	0
$meadow_2$		0	0	0	0
$corn_1$		10-55-40	10-30-15	25-25-10	19-30-15
$corn_2$		30-30-30	30-10-0	55-25-10	45-21-10
oats		0-50-30	0-30-0	0-20-0	0-26-4
meadow		0	0	0	0
continuous corn		65-55-40	60-30-15	110-25-15	91-30-18

APPENDIX B

The data of this appendix are the basic input-output data from which most of the programming coefficients were derived. Insofar as it was thought to be correct, the same coefficients or coefficients, altered only slightly to account for differences in productivity and costs, were used among all of the areas and states in the Lake States Dairy Adjustment Study. This procedure was used for maximum comparability of the programming results among the different states and areas. The interregional competition aspects of this study require common assumptions and comparable prices and coefficients in the several states.

Table 38. Speed and efficiency factors for computing labor and machine time on crops[a]

Machine	Suggested speed M.P.H.	% Efficiency
Plow	4.0	82
Disc	4.0	82
Harrow	4.5	82
Cultipacker	4.0	82
Grain drill	4.0	78
Corn planter, 2-4 row	4.0 (drilled)	78 (58 checked)

[a]Sources: Ulvilden (58), Ulvilden and Benrud (59) and Burdick (9). To compute the labor and machine times for crops, the complement of machinery which was typical for the strata (representative farm) concerned was selected to determine operations and machine size. Then, the following formula was used to compute theoretical acres per hour:

$$\text{speed} \times \text{width} \times 0.1212 = \text{theoretical acres per hour}$$

Multiplying by the efficiency factor gives the effective acres per hour to account for field efficiency. The efficiency factor does not include any allocation of overhead time for conditioning machines, repairs, or other loss of field time.

Table 38 (Continued).

Machine	Suggested speed M.P.H.	% Efficiency
Corn cultivator	1st cultivation - 3.5	84
" "	2nd " - 4.0	84
" "	3rd " - 4.5	84
Corn picker	3.0	68
Pick sheller	3.0	60
Grain swather	4.5	82
Combine, 6 ft. or less	2.5	68
Combine, over 6 ft.	3.5	68
Mower	4.5	79
Raking, all types	4.5	86

Table 39. Labor and machine time requirements for chopping and moving silage into storage and for baling and hauling hay[a]

Operation	Man hours/acre/cutting
Square baler, P.T.O.	.5
Hauling & storing dropped bales	1.8
Hauling & storing loaded bales	1.5
Field chopper	.3
Hauling & storing chopped forage	.9

[a]These figures assume yields of 1 ton/acre per cutting. Labor and machine requirements for chopping and baling hay will vary pretty directly with tonnage as more swaths are put in each windrow. The data for this table were compiled and adapted from Ulvilden (58), Ulvilden and Benrud (59), and Burdick (9), after consultation with agricultural engineers at the University of Minnesota.

Table 40. Costs of machinery operation by tasks[a]

Machine	Fuel[b]	Repairs and servicing[c]		
		Total cost	Acres over	Cost per acre
	Gallons per acre			
Plow (3-14")	1.75			
Disc, 10'	.53			
" , 12'	.46	$96.15	124	$ .78
Harrow, 20'	.20			
" , 25'	.17			
Drill, 10'	.52	5.40	54	.10
" , 12'	.43			
Corn planter,				
2 row	.82	12.62	72	.18
4 row	.40			
Cultivator, 2 row				
1st time	.69	27.64	203	.14
2nd time	.62			
3rd time	.56			
Corn picker,				
1 row	2.43	27.04	45	.60
2 row	1.21	78.13	96	.81
Mower, 7'	.48	43.27	77	.56
Rake, 8'	.38			
Combine, 6'	1.44	56.08	48	1.17

[a]Source of data is the Minnesota Farm Record Project (61) and Ulvilden (58).

[b]Fuel for power unit.

[c]Per operation, i.e., if discing twice, multiply by 2, etc. For every $1.00 spent for fuel about 16.33¢ will cover tractor repairs and another 16.33¢ will cover the cost of grease and oil. Does not include items such as twine or wire.

Table 40 (Continued)

Machine	Fuel[b]	Repairs and servicing[c]		
		Total cost	Acres over	Cost per acre
	Gallons per acre			
Field chopper, P.T.O.	.5	93.75	77	1.22
Hauling and storing chopped forage	1.1	54.09	178	.39
Hauling and storing bales	1.4			
Baler, P.T.O.	.9	63.70	190	.34

Table 41. Overhead labor requirements by use of labor[a, b]

Item	Hours of labor (dairy farms)	Hours of labor (feeders & hog farms)
Farmstead	99	176
Building repair	168	171
Fences	87	112
Machinery & equipment	199	319
Tractor repair	27	42
Truck & auto repair	15	20
Farm Business	161	224
Miscellaneous	38	45
Total overhead	794	1109
Other labor	4167	3306
Percent overhead is of total labor	16.0	25.1
Average acres	190	290
Hours per acre (overhead)	4.18	3.82

[a]The overhead labor requirements were distributed seasonally as follows:

Jan.-Mar:	16.8%	Aug.	11.2%
Apr.-May:	14.4%	Sept.-Oct.:	22.3%
June-July:	21.7%	Nov.-Dec.:	13.6%

[b]Source of data is Minnesota farm record project (61).

Table 42. Production costs and labor requirements for cropping sequences with costs and labor for harvesting excluded

	Unit	Area I COMM F_o	COMM F_1	CCOM F_o	CCOM F_1	C F_o	C F_1
Machinery costs	Dol.	7.26	7.12	8.64	8.36	1.38	1.24
Seed costs	Dol.	10.61	10.61	13.61	13.61	3.00	3.00
Tractor costs	Dol.	3.09	2.51	5.70	4.50	2.62	2.04
Fertilizer & spray costs	Dol.	0	15.81	0	29.52	0	17.33
Total cost (4 years)	Dol.	20.96	36.05	27.95	56.03		
Annual cost	Dol.	5.24	9.01	6.99	14.01	7.00	23.61
Labor							
Jan.-Feb.-Mar.	Hrs.	0	0	0	0	0	0
Apr.-May	Hrs.	0.502	0.502	0.747	0.747	0.98	0.98
June-July	Hrs.	1.123	1.123	1.407	1.407	1.773	1.773
Aug.	Hrs.	0.318	0.318	0.159	0.159	0	0
Sept.-Oct.	Hrs.	0.343	0.343	0.616	0.616	1.094	1.094
Nov.-Dec.	Hrs.	0	0	0	0	0	0

Table 42 (Continued).

	Unit	Area II COMM F_o	COMM F_1	CCOM F_o	CCOM F_1	C F_o	C F_1
Machinery costs	Dol.	7.26	7.12	8.64	8.36	1.38	1.24
Seed costs	Dol.	10.61	10.61	13.61	13.61	3.00	3.00
Tractor costs	Dol.	3.09	2.51	5.70	4.54	2.62	2.04
Fertilizers & spray costs	Dol.	0	10.47	0	23.80	0	17.63
Total cost (4 years)	Dol.	20.96	30.71	27.95	50.31		
Annual cost	Dol.	5.24	7.68	6.99	12.58	7.00	23.91
Labor							
Jan.-Feb.-Mar.	Hrs.	0	0	0	0	0	0
Apr.-May	Hrs.	0.502	0.502	0.747	0.747	0.980	0.980
June-July	Hrs.	1.123	1.123	1.407	1.407	1.773	1.773
Aug.	Hrs.	0.318	0.318	0.159	0.159	0	0
Sept.-Oct.	Hrs.	0.343	0.343	0.616	0.616	1.094	1.094
Nov.-Dec.	Hrs.	0	0	0	0	0	0

Table 43. Feed coefficients for dairy cows[a]

Ration	Concentrates			Roughage[b]	Milk Production
	Grain	Protein	Total		
	lbs. corn equivalent	lbs. soybean oilmeal	lbs.	lbs. hay equivalent	lbs.
1	4.260	120	4,380	10,360	10,900
2	2,380	120	2,500	11,600	10,000
3	1,420	120	1,540	12,100	9,210

[a]Sources of data are: Redman and Olson (39), Heady et al. (21) and Jensen et al. (27). These estimates were made using predetermined grain: milk ratios of 1:2.50, 1:4.00 and 1:6.00 with cows fed at the stomach limit capacity. It is assumed that the forage was of medium quality and that the cows are capable of giving 10,000 lbs. of 3.5 percent fat correlated milk when fed at the 1:4.00 grain: milk ratio. If replacements are raised, add 2,613 lbs. hay equivalent and 836 lbs. grain (corn equivalent) of which 164 lbs. should be supplied as soybean oilmeal. This assumes other dairy cattle are in the herd in numbers equal to 95 percent of the cows.

[b]Includes an estimated wasteage of hay of 8 percent. Roughage obtainable from pasture is included in the roughage requirements.

Table 44. Winter labor requirements for dairy cattle in stanchions (per week)[a]

Task	Fixed labor 5 head[b]	Additional labor per head over 5 head	Proportion of cows in herd
	Hours/week	Hours/week	Factor[c]
Milking:			
2 single units, 1 worker	4.2630	0.8119	.89
3 single units, 1 worker	4.4809	.7237	.89
Cleaning and preparation of utensils:			
2 single units, mfg. milk, cans	3.62	-	-
2 single units Grade A, cans or bulk tank	5.13	-	-
3 single units, mfg. milk, cans	4.42	-	-
3 single units, Grade A, bulk tank	5.95	-	-
Hay feeding:			
Baled hay, fed once a day	1.0699	.0355	1.07
Baled hay, fed twice a day	1.6599	.0355	1.07
Silage feeding:			
Mechanically unloaded with cart	1.0939	.0617	1.05
Manually unloaded with cart	1.4239	.0617	1.05

[a]These labor requirements were developed from Aune and Day (2) and Day, Aune and Pond (11). Labor for feed grinding was added at the rate of 1.24 hours per ton.

[b]This is the total labor requirement for the first five cows (includes both fixed and variable labor) so these values were divided by 5 to get the per cow labor requirement for the first 5 cows.

[c]This factor is the proportion of cows in herd for which each task is performed. The factors here are from Minnesota data (2). Local factors were used when available.

Table 44 (Continued).

Task	Fixed labor 5 head[b]	Additional labor per head over 5 head	Proportion of cows in herd
	Hours/week	Hours/week	Factor[c]
Grain feeding:			
Fed once a day	.6278	.0383	1.03
Fed twice a day	1.1872	.0383	1.03
Manure handling:			
Gutter cleaner	2.5965	.0629	1.07
Drive thru or litter carrier	3.4707	.1235	1.07
Bedding:			
Baled and chopped	1.2246	.0289	1.07
Other routine work	.8564	.0552	1.11
Care of dairy cattle not in stanchions	3.6409	.1828	.92
Miscellaneous labor:			
Dairy cattle in stanchions	.96	-	1.07
Dairy cattle not in stanchions	.18	-	.92

Table 45. Summer and supplemental feeding season labor requirements for dairy cattle in stanchions (per week)[a]

Task	Fixed labor 5 head[b]	Additional labor per head over 5 head	Proportion of cows in herd
	Hours/week	Hours/week	Factor[c]
Milking:			
2 units, 1 worker	5.0184	.6520	.84
3 units, 1 worker	3.1823	.7348	.84
Cleaning and preparation of utensils:			
2 units mfg. milk, cans	3.72	-	-
2 units Grade A, cans or bulk tank	4.37	-	-
3 units mfg. milk, cans	4.32	-	-
3 units Grade A, bulk tank	5.46	-	-
Hay feeding (summer):			
Baled hay, fed inside	1.39	-	.98
Baled hay, fed outside	.85	-	.98
Hay feeding (supplemental season):			
Baled hay, fed outside	1.41	-	-
Baled hay, fed inside, once a day	1.06	-	-
Baled hay, fed inside, twice a day	2.59	-	-

[a]These labor requirements were developed from Aune and Day (2) and Day, Aune and Pond (11). Labor for feed grinding was added at the rate of 1.24 hours per ton.

[b]This is the total labor requirement for the first five cows (includes both fixed and variable labor) so these values were divided by 5 to get the per cow labor requirement for the first 5 cows.

[c]This factor is the proportion of cows in herd for which each task is performed. The factors here are from Minnesota data (2). Local factors were used when available.

Table 45 (Continued).

Task	Fixed labor 5 head[b]	Additional labor per head over 5 head	Proportion of cows in herd
	Hours/week	Hours/week	Factor[c]
Grain feeding:			
Fed once a day	1.06	-	-
Fed twice a day	1.72	-	-
Manure handling:			
Gutter cleaner	1.63	-	-
Drive thru or litter carrier (Grade A producers)	1.84	-	-
Drive thru or litter carrier (mfg. milk producers)	1.05	-	-
Bedding	.0530	.0496	.98
Other routine work	2.820	-	-
Care of cattle not in stanchions:			
Pens only	.7942	.3670	.52
Pastured separately only	.8178	.0669	1.01
Miscellaneous labor:			
Dairy cattle in stanchions	.62	-	-
Dairy cattle not in stanchions	-.0185	.0123	100
Daily rotational grazing	1.55	-	-

Table 46. Winter labor requirements for dairy cattle (per week) with loose-housing and double- 4 herringbone parlor[a]

Task	Fixed labor per head for first 5 cows	Additional labor per head over 5 cows	Proportion of cows in herd
	Hours/week	Hours/week	Factor[b]
Milking	.5523	.328	.89
Cleaning bulk tank	.2890	0	-
Clean-up of parlor	1.0033	0	-
Preparation of equipment	.7088	0	-
General cleaning	.6360	0	-
Bedding	.1904	.03	1.0
Calf-feeding	.4256	.114	.5
Miscellaneous	.6650	0	-
Hay-feeding	.0545	.025	1.5
Silage-feeding	-.2224	.097	1.5

[a]These labor coefficients were developed from Aune and Day (2) and Fuller and Jensen (15). Labor for feed-grinding was added at the rate of 1.24 hours per ton. Labor for silo-opening is 1.86 hours per silo. Labor for manure-hauling was computed at the rate of 15.276 hours + 1.938 x number of cows in herd. Manure hauling labor was divided between March and April.

[b]This factor is the proportion of cows in herd for which each task is performed. The factors listed here are from Minnesota data (2). Local factors were used when available.

Table 47. Summer labor requirements for dairy cattle (per week) with loose-housing and double-4 herringbone parlor[a]

Task	Fixed labor per head for first 5 cows	Additional labor per head over 5 cows	Proportion of cows in herd
	Hours/week	Hours/week	Factor[b]
Milking	.5357	.328	.84
Cleaning bulk tank	.2574	0	-
Clean-up of parlor	.8926	0	-
Preparation of equipment	.6382	0	-
General cleaning	.3860	0	-
Bedding calves	.1892	.01585	.2353
Calf feeding	-.1126	.341	.2353
Miscellaneous	.5786	0	-
Hay-feeding (1 x per day) regular summer months	.1340	.026	1.00
Hay feeding (2 x per day) beginning September 15	.2320	.026	1.00
Pasturing	.4660	0	-

[a]These labor coefficients were developed from Aune and Day (2) and from Fuller and Jensen (15). Labor for feed-grinding was added at the rate of 1.24 hours per ton.

[b]This factor is the proportion of cows in herd for which each task is performed. The factors listed here are from Minnesota data (2). Local factors were used when available.

Table 48. Miscellaneous costs for dairy cows, per head[a]

Herd size	Item				
	Power	Equipment	Shelter	Miscellaneous	Total
	$/head	$/head	$/head	$/head	$/head
Cows:					
6-13 head	3.62	8.63	6.78	23.83	42.86
14-21 head	3.62	8.63	5.65	23.83	41.73
22 or more head	3.62	8.63	4.14	23.83	40.22
Other dairy cattle:					
7-15 head	1.21	-	4.52	2.07	7.80
16-24 head	1.21	-	2.64	2.07	5.92
25 or more head	1.21	-	2.26	2.07	5.54

[a]Source of data is Hasbargen and Pond (16).

Table 49. Costs of expanding dairy facilities by types of facility[a]

Facility	Cost per cow
Stanchion barn, one-story (no milk house added)	$ 529.31[b]
Loose-housing (pole-barn and concrete yard requirements)	112.00[c]
Milking parlor (herringbone double 4-building, feeder, stalls and milking equipment)	7,353.00[d]
Bulk tank	1,500. fixed cost plus 50. per cow

[a]Source of data is Hoglund, _et al_. (23) and Strain _et al_. (54).

[b]Includes space for replacements at the rate of .95 head of other cattle in the herd to every cow. Space for cows is provided at the rate of 2.75 linear feet per cow.

[c]Assumes housing young stock in old stanchion barn. Space for cows is provided at the rate of 75 square feet per cow.

[d]This is a _total cost_ and as such is charged against the first five cows. The variable cost of expanding beyond 5 cows is only the cost of the pole-barn and concrete yards.

Table 50. Feed requirements for hog production[a]

Feed	Unit	One litter system-one litter to weaning	Two litter system-two litters to weaning	Growing & fattening spring pigs	Growing & fattening fall pigs
		per sow	per sow	per pig	per pig
Corn	lbs.	2179	3592	547	620
Soybean oilmeal	lbs.	391	667	84	68
Pasture	acres	.05	.05	.05	0
Mineral	lbs.	8	10	3.8	4.3

[a]Sources: Hoifer, et al. (24), McKee (34) and Heady et al. (22).

Table 51. Annual miscellaneous costs for hog production[a]

Item	One litter system-one litter to weaning	Two litter system-two litters to weaning	Growing & fattening spring pigs	Growing & fattening fall pigs
	$/sow	$/sow	$/pig	$/pig
Power equipment costs	4.33	7.83	.77	.75
Vaccination	3.87	7.17	-	-
Other	9.29	18.64	3.28	3.50

[a]Source: Atkinson and Hardin (1).

Table 52. Labor requirements for hog production[a]

Time of year	Unit	One litter system-One litter to weaning	Two litter system-Two litters to weaning	Growing & fattening spring pigs	Growing & fattening fall pigs
		per sow	per sow	per pig	per pig
Jan.-Feb.-Mar.	Man hr.	7.5	7.5		.66
Apr.-May	Man hr.	5.2	5.2	.33	
June-July	Man hr.	.6	.6	.66	
Aug.	Man hr.	.3	.6	.33	
Sept.-Oct.	Man hr.	.8	7.4		
Nov.-Dec.	Man hr.	1.6	1.6		.66
Total for year	Man hr.	16.0	22.9	1.32	1.32

[a]Source: Bailey and Sitterly (3).

Table 53. Total feed requirements for feeder cattle by feeding systems[a]

Feed requirement	Unit	Calves drylot	Calves, full fed on pasture	Calves, full fed after 56 days	Long yearlings roughed & full fed
Corn equivalent	Bu.	69.5	72.3	57.5	43.6
Protein	Lbs.	372	124	127	178
Hay equivalent	Tons	.940	.642	.812	.234
Pasture	Tons H.E.	-	1.1	2.2	0

[a]Source of data is Field Station Report 34 Iowa Agricultural Experiment Station (25) and Illinois Farm Records (1952-57) (60).

Table 54. Feeder cattle labor inputs by system and lot size (per week)[a]

System	Period (weeks)	Lot size (head) 30 Total	30 Per head	40 Total	40 Per head	50 Total	50 Per head	60 Total	60 Per head	100 Total	100 Per head
Yearling steers											
roughed, limited grain	10.7	8.88	.296	10.02	.250	11.16	.223	12.30	.205	16.86	.169
fullfeed drylot	17.9	8.93	.298	10.42	.261	11.91	.238	13.40	.223	19.38	.194
Calves, drylot											
Limited grain	19.6	8.88	.296	10.02	.250	11.16	.223	12.30	.205	16.86	.169
Full fed	32.3	8.93	.298	10.42	.261	11.91	.238	13.40	.223	19.36	.194
Calves, full fed on pastures											
Limited grain	19.6	8.88	.296	10.02	.250	11.16	.223	12.30	.205	16.86	.169
Fullfeed drylot	7.5	8.93	.298	10.42	.261	11.91	.238	13.40	.223	19.36	.194
Fullfeed pasture	24.9	7.24	.241	7.92	.198	8.59	.172	9.26	.154	11.94	.119
Calves, full fed after 56 days (deferred fed calves)											
Limited grain	27.1	8.86	.295	10.00	.250	11.14	.223	12.28	.205	16.84	.168
Pasture only	7.7	3.19	.106	3.29	.082	3.39	.068	3.49	.058	3.89	.389
Fullfeed pasture	16.0	7.22	.241	7.90	.198	8.57	.171	9.24	.154	11.92	.119
Fullfeed drylot	5.4	8.91	.297	10.40	.260	11.89	.240	13.38	.223	19.34	.193

[a]Labor inputs, when applicable, are for pasturing by regular conventional grazing, feeding baled hay, feeding grain twice daily (limited and full feed), feeding from an upright silo twice daily, bedding 2-3 times per week, watering and checking, grinding feed, manure hauling, care of sick animals, buying and selling and miscellaneous tasks. Source of data is Johnson and Nodland (28).

Table 55. Miscellaneous costs for feeder cattle, per head[a]

System	Cost item				
	Power	Equipment	Shelter	Other	Total
Yearling steers	$1.57	$1.12	$1.03	$1.84	$5.56
Calves, drylot	2.66	1.54	1.43	2.65	8.28
Calves, full fed on pasture	2.79	1.63	1.51	2.78	8.71
Calves, full fed after 56 days	2.93	1.70	1.57	2.93	9.13

[a]No interest charges are included and only cash costs of equipment and shelter are included (no depreciation). The data are from Hasbargen and Pond (16). It is assumed in this study that any type of farm has sufficient facilities to feed up to 18 head of feeders with no additional expense for buildings and equipment. In order to expand beyond that number, if they do not have facilities for more than 18 head at present, it would be necessary to incur the following expenses:

Pole-shed: 40 sq. ft.	$44.80
Pens and troughs	7.28
Total cost per head	$52.08

Costs will be higher for small operations. However, commercial size feeding herds we assumed the depreciation period is 15 years for all facilities and the interest rate $5\frac{1}{2}$ percent. These facilities can be used by breeding herds or beef-feeding enterprises.

Table 56. Beef output for each feeding system

System	Purchase weight	Selling weight	Beef produced
	lbs.	lbs.	lbs.
Yearling steers	693	1,087	394
Calves, drylot	430	979	549
Calves, full-fed on pasture	430	1,007	577
Calves, full-fed after 56 days (deferred fed calves)	430	1,035	605

Table 57. Feeding requirements for beef cow herds[a]

Type of feed	Unit	Yearly ration for 6 month pasture season	Yearly ration for 5 month pasture season
Hay equivalent	Ton	1.80	2.10
Corn equivalent	Bu.	0.30	0.34
Protein supplement (SBOM)	Lbs.	59	68
Pasture	Pasture days	183	152

[a]Data is from Bortfield et al. (6). It is assumed that the beef herd is one that provides its own replacements and that the herd will have a 90 percent calf crop. An annual replacement rate of 15 percent of the cow herd is used. Calves average 430 lbs. by October 15. Thus, the production per cow is estimated to be 322.5 lbs. of calf and 150 lbs. of cull cow. These coefficients include requirements for one bull for every 30 cows, and replacements at the rate specified.

Table 58. Labor coefficients per beef cow (hours per week)[a]

Period	Herd size (cows)	
	15 cows	30 cows or more
Jan. - Mar.	.32	.20
Apr. - May	.13	.07
June - July	.13	.07
Aug.	.13	.07
Sept. - Oct.	.13	.07
Nov. - Dec.	.32	.20

[a]Includes calf (non-creep) and replacements. Coefficients are based on Winter labor requirements from Nov. 1 to Apr. 1. Although the pasture season is not quite this long many chore items are eliminated shortly after Apr. 1 Source: Janssen (26).

Table 59. Miscellaneous costs per beef cow for various herd sizes[a]

Item	6-23 cows	24-44 cows	45 or more cows
Machinery & equipment	$ 2.99	$2.99	$2.99
Shelter	4.75	3.56	2.97
Other	2.48	2.48	2.48
Total	10.22	9.03	8.44

[a]Source: Janssen (26). Includes electricity, gas and oil, insurance, insect spray, etc. No charge is made for breeding as the value of the bull tends to average out if young bulls are purchased and sold at heavier weights.

APPENDIX C

Table 60. Prices used in computing optimum farm plans

	Unit	Purchase Price	Weight	Selling price	Weight
Seed and fertilizer					
Corn	bu.	$12.00			
Oats	bu.	0.85			
Alfalfa	lb.	0.57			
Nitrogen (N)	lb.	0.13			
Phosphorous (P_2O_5)	lb.	0.09			
Potassium (K_2O)	lb.	0.05			
Feed and grain					
Corn	bu.	1.16		$ 1.11	
Oats	bu.			0.555	
Dairy supplement	cwt.	5.56			
Calf starter	cwt.	5.70			
Milk replacer	cwt.	3.53			
Beef supplement	cwt.	4.63			
Hog supplement	cwt.	4.01			
Livestock & livestock products					
Feeder calves	cwt.	22.50	430 lb.		
Choice-fed steers:					
Dry-lot	cwt.			23.50	979 lb.
Pastured	cwt.			23.50	1007 lb.
Deferred	cwt.			23.50	1035 lb.
Medium yearlings	cwt.	18.50	693 lb.	21.50	1087 lb.
Dairy cows	cwt.	300.00			
Cull dairy cows	cwt.			13.15	1200 lb.
Milk heifers	per heifer	150.00		150.00	
Veal calves	per calf			12.00	

Table 60 (Continued)

	Unit	Purchase price	Weight	Selling price	Weight
Sows	cwt.			12.89[a]	350 lb.
225# market hogs	cwt.			14.10[a]	225 lb.
Manufacturing-grade milk	cwt.			3.00[a]	
Grade A milk	cwt.			4.00[a]	
Housing & equipment (investment cost)					
Silo capacity	per ton	20.16			
Stanchion barn	per cow	529.31			
Milking parlor including milking equipment & bulk tank	unit cost	9103.00			
Pole shed (for beef or loose housing dairy)	per A.U.	91.15			
Hog farrowing & feeding capacity	per litter	279.00			

[a]These are projected prices. These products were actually variable priced.

APPENDIX D

Table 61. Resource availability by area and stratum (representative farm)[a]

		Area I				
Resource	Unit	Grade A dairy	Small farm, no dairy facilities	Large farm, no dairy facilities	Small dairy farm	Large dairy farm
Cash on hand	dollars	2,177.74	2,653.61	2,359.22	1,392.13	1,178.49
Short-term credit borrowing capacity[b]	dollars	5,254.00	3,142.00	6,522.00	3,618.00	4,134.00
Long-term credit borrowing capacity[c]	dollars	38,872.00	13,746.00	30,200.00	14,109.00	22,286.00
Cropland	acres	272.1	75.8	234.7	96.8	196.8
Operator and family labor:						
Jan.-Feb.-Mar.	hours	1410	472	835	789	921
Apr.-May	hours	1093	370	712	664	741
June-July	hours	1094	385	736	758	809
Aug.	hours	543	193	356	379	401
Sept.-Oct.	hours	1037	395	652	642	737
Nov.-Dec.	hours	894	269	528	515	766

[a]See map, figure 2, for designation of area. The resources available, in each of the ten stratum, are averages from the farm survey. Each farm in the survey was placed in one of the ten strata. The five farm types are: (1) farms having Grade A dairy facilities; (2) farms having less than 130 acres cropland and no dairy facilities; (3) farms having 130 acres or more of cropland and no dairy facilities; (4) farms having less than 130 acres cropland, but having dairy facilities for producing manufacturing-grade milk; and (5) farms having 130 or more acres of cropland and having facilities for producing manufacturing-grade milk.

[b]Short-term credit borrowing capacity was restricted to one-half of the average of farmers' equity in machinery plus varying percentages of livestock investment costs as livestock were introduced into the farm plans.

[c]Long-term credit borrowing capacity was restricted to one-half of the average of the farmers' equity in real estate. This type of credit was used only for building investments in the program.

Table 61 (Continued).

Resource	Unit	Area I Grade A dairy	Small farm, no dairy facilities	Large farm, no dairy facilities	Small dairy farm	Large dairy farm
Labor-hiring limitation:[d]						
Jan.-Feb.-Mar.	hours	77	203	156	65	67
Apr.-May	hours	98	171	165	77	73
June-July	hours	133	179	212	89	90
Aug.	hours	60	84	101	40	46
Sept.-Oct.	hours	60	162	127	59	52
Nov.-Dec.	hours	60	154	161	38	50
Corn-acres limit[e]	acres	266.7	74.2	230.1	94.8	192.8
Dairy capacity (stanchion barn)	cows	40.0	0	0	18.0	19.0
Farrowing capacity	litters	16.1	6.9	28.9	11.8	15.8
Beef capacity	animal units	37.5	10.0	43.1	10.0	11.0
Silo capacity	tons	211	10	41	59	75
Permanent pasture production	tons hay equivalent	2.1	12.9	14.6	15.1	16.0

[d]Labor hiring was limited to that amount which had been hired previously plus the average amount of off-farm work done by the farm operators.

[e]Corn-acres limit was computed as a percentage of total cropland acres which could be planted to corn to hold erosion losses to tolerable levels.

Table 61 (Continued).

Resource	Unit	Area II Grade A dairy	Small farm, no dairy facilities	Large farm, no dairy facilities	Small dairy farm	Large dairy farm
Cash on hand	dollars	3,610.03	883.89	2,465.92	935.22	1,357.62
Short-term credit borrowing capacity[b]	dollars	3,408.00	2,825.00	5,540.00	2,546.00	5,332.00
Long-term credit borrowing capacity[c]	dollars	17,642.00	15,740.00	20,998.00	10,819.00	20,292.00
Cropland	acres	172.8	72.3	189.8	90.5	214.8
Operator and family labor:						
Jan.-Feb.-Mar.	hours	1273	560	689	829	991
Apr.-May	hours	917	505	553	671	845
June-July	hours	863	562	594	714	889
Aug.	hours	429	281	300	362	444
Sept.-Oct.	hours	814	442	527	684	804
Nov.-Dec.	hours	639	384	457	537	599
Labor-hiring limitation:[d]						
Jan.-Feb.-Mar.	hours	0	228	116	92	138
Apr.-May	hours	86	172	218	76	138
June-July	hours	171	215	368	97	133
Aug.	hours	86	113	188	47	89
Sept.-Oct.	hours	128	142	240	67	151
Nov.-Dec.	hours	128	159	148	67	80
Corn-acres limit[e]	acres	110.6	46.3	121.4	57.9	137.4
Dairy capacity (stanchion barn)	cows	41.0	0	0	16.0	21.0
Farrowing capacity	litters	19.5	16.7	20.8	13.8	21.8
Beef capacity	animal units	10.0	18.9	60.6	10.0	23.8
Silo capacity	tons	50	0	26	23	52
Permanent pasture production	tons hay equivalent	13.5	15.4	22.0	32.4	39.4

APPENDIX E

In this appendix, the optimum plans for selected prices of milk and hogs are presented in greater detail than was possible in the price maps in the chapter on programming results. In addition to the enterprises given in the price maps, the following tables give, for certain milk and hog prices the facilities added to present livestock buildings, feed handling and sales, capital borrowing and marginal value products, marginal value products for labor and cropland and net farm incomes. The farm plans which follow are for milk prices below which milk production is profitable, and then at $0.40 intervals for higher milk prices. Each of these plans for the above milk prices are repeated for hog prices of $11.10, $12.60, $14.10, $15.60, $17.10 and $18.60 per cwt. for each of the ten representative farms.

The following definitions apply to all tables in Appendix E:

(1) Each sow in a two-litter system produces a spring and a fall litter. Each sow in a one-litter system produces only a spring litter.

(2) Beef cows and feeder cattle use beef housing and facilities according to their animal unit rating.

(3) MVP for operating capital is the return to an additional dollar of operating capital.

(4) MVP for family labor is the return to an additional man-hour of labor.

(5) Income in these plans is defined as gross income minus variable costs, interest on borrowed capital and a depreciation charge for new buildings and equipment.

Table 62. Optimum organization of the grade A dairy farm in the Carrington-Clyde soil area (Farm I-1) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

	Unit	Milk price per cwt. $0- 2.38	$2.40	$2.80	$3.20
Crop enterprises:					
Cont. corn	acres	228	227	93	76
CCOM	acres	0	0	0	0
COMM	acres	44	45	179	196
Livestock enterprises:					
Cows milked	cows	0	7	23	40
Milk sold	cwt.	0	705	2505	4360
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	5	0	0	0
Medium yearlings	head	62	67	177	106
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	0	0	0	0
Beef	A.U.	0	0	63	23
Feed:					
Corn harvested for grain	bu.	16,763	15,850	8,639	9,651
Corn harvested for silage	tons	0	156	211	364
Corn purchased	bu.	0	0	0	0
Corn sold	bu.	14,065	12,845	0	0
Hay baled	tons	60	42	190	148
Capital:					
Operating capital borrowed	$	13,635	16,403	36,472	32,392
MVP for operating capital	$	.92	.73	.62	.07
Long-term capital borrowed	$	0	0	5,747	5,137
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	.09
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs/yr.	0	0	0	0
MVP for cropland	$/acre	28.50	33.46	36.37	54.82
Income	$	14,451	14,484	15,433	16,793

Table 62 (Continued).

	Unit	Milk price per cwt. $0-3.60	$4.00	$4.40
Crop enterprises:				
Cont. corn	acres	32	34	34
CCOM	acres	0	0	0
COMM	acres	240	238	238
Livestock enterprises:				
Cows milked	cows	54	77	77
Milk sold	cwt.	5870	8441	8441
Dairy system	-	stanchion	parlor	parlor
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	67	0	0
Facilities added for:				
Dairy	cows	14	77	77
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	4502	2312	2312
Corn harvested for silage	tons	392	803	803
Corn purchased	bu.	1672	3047	3047
Corn sold	bu.	0	0	0
Hay baled	tons	163	67	67
Capital:				
Operating capital borrowed	$	33,213	34,000	34,000
MVP for operating capital	$	.07	.12	.12
Long-term capital borrowed	$	10,979	33,338	33,338
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	.21	.37	.37
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs./yr.	0	0	0
MVP for cropland	$/acres	55.70	57.78	57.78
Income	$	18,636	21,551	24,927

Table 62. (Continued)

	Unit	Milk price per cwt. $4.80	$5.20
Crop enterprises:			
Cont. corn	acres	53	53
CCOM	acres	0	0
COMM	acres	219	219
Livestock enterprises:			
Cows milked	cows	78	78
Milk sold	cwt.	8491	8491
Dairy system	-	parlor	parlor
Two-litter hog system	sows	0	0
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	78	78
Hogs	sows	0	0
Beef	A.U.	0	0
Feed:			
corn harvested for grain	bu.	2738	2738
Corn harvested for silage	tons	903	903
Corn purchased	bu.	2779	2779
Corn sold	bu.	0	0
Hay baled	tons	36	36
Capital:			
Operating capital borrowed	$	34,171	34,171
MVP for operating capital	$	.55	.55
Long-term capital borrowed	$	35,427	35,427
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	1.88	1.88
Nov.-Dec.	$/hr.	0	0
Total hired labor used	hrs./hr.	60	60
MVP for cropland	$/acre	77.24	77.24
Income	$	28,308	31,722

Table 63. Optimum organization of the grade A dairy farm in the Carrington-Clyde soil area (Farm I-1) at selected prices for milk and hog price $14.10 per cwt.

		Milk price per cwt.			
	Unit	$0-2.41	$2.80	$3.20	$3.60
Crop enterprises:					
Cont. corn	acres	205	114	67	32
CCOM	acres	0	0	0	0
COMM	acres	67	158	205	240
Livestock enterprises:					
Cows milked	cows	0	21	40	54
Milk sold	cwt.	0	2251	4360	5870
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	16	11	8	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	10	0	0	0
Medium yearlings	head	57	143	67	67
Facilities added for:					
Dairy	cows	0	0	0	14
Hogs	sows	0	0	0	0
Beef	A.U.	0	44	0	0
Feed:					
Corn harvested for grain	bu.	15,602	9,707	7,085	4,502
Corn harvested for silage	tons	0	211	250	392
Corn purchased	bu.	0	0	0	1,672
Corn sold	bu.	9,284	0	0	0
Hay baled	tons	60	149	150	163
Capital:					
Operating capital borrowed	$	15,339	32,496	27,679	33,212
MVP for operating capital	$	.92	.44	.07	.07
Long-term capital borrowed	$	0	3,962	795	10,962
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	1.52	.16	.16
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs/yr.	0	0	0	0
MVP for cropland	$/acre	28.50	38.89	55.35	55.35
Income	$	14,734	15,313	16,825	18,640

Table 63 (Continued).

	Unit	Milk price per cwt. $4.00	$4.40	$4.80	$5.20
Crop enterprises:					
Cont. corn	acres	34	34	53	53
CCOM	acres	0	0	0	0
COMM	acres	238	238	219	219
Livestock enterprises:					
Cows milked	cows	77	77	78	78
Milk sold	cwt.	8441	8441	8491	8491
Dairy system	-	parlor	parlor	parlor	parlor
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	77	77	78	78
Hogs	sows	0	0	0	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	2,312	2,312	2,738	2,738
Corn harvested for silage	tons	803	803	903	903
Corn purchased	bu.	3,047	3,047	2,779	2,779
Corn sold	bu.	0	0	0	0
Hay baled	tons	67	67	36	36
Capital:					
Operating capital borrowed	$	34,000	34,000	34,171	34,171
MVP for operating capital	$	.12	.12	.55	.55
Long-term capital borrowed	$	33,338	33,338	35,427	35,427
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	.37	.37	1.88	1.88
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	0	60	60
MVP for cropland	$/acre	57.77	57.77	77.16	77.16
Income	$	21,551	24,927	28,308	31,722

Table 64. Optimum organization of the grade A dairy farm in the Carrington-Clyde soil area (Farm I-1) selected prices for milk and hog price $15.60 per cwt.

		Milk price per cwt.			
	Unit	$0-313	$3.20	$3.60	$4.00
Crop enterprises:					
Cont. corn	acres	135	61	61	2
CCOM	acres	116	0	0	0
COMM	acres	21	211	211	270
Livestock enterprises:					
Cows milked	cows	0	40	40	56
Milk sold	cwt.	0	4360	4360	6145
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	58	21	21	16
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	38	39	39	0
Facilities added for:					
Dairy	cows	0	0	0	16
Hogs	sows	42	5	5	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	14,068	7,023	7,023	3,979
Corn harvested for silage	tons	0	211	211	211
Corn purchased	bu.	0	1,784	1,784	3,027
Corn sold	bu.	0	0	0	0
Hay baled	tons	35	138	138	173
Capital:					
Operating capital borrowed	$	16,714	27,567	27,567	28,036
MVP for operating capital	$	.31	.13	.13	.09
Long-term capital borrowed	$	11,579	1,419	1,419	8,672
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	1.32
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	.85	2.01	2.01	1.32
Nov.-Dec.	$/hr.	0	0	0	1.32
Total hired labor used	hrs./hr.	0	60	60	77
MVP for cropland	$/acre	26.95	53.25	53.25	51.01
Income	$	17,423	17,703	19,447	21,675

Table 64 (Continued).

	Unit	Milk price per cwt. $4.40	$4.80	$5.20
Crop enterprises:				
Cont. corn	acres	34	53	53
CCOM	acres	0	0	0
COMM	acres	238	219	219
Livestock enterprises:				
Cows milked	cows	77	78	78
Milk sold	cwt.	8441	8491	8491
Dairy system	-	parlor	parlor	parlor
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	77	78	78
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	2312	2738	2738
Corn harvested for silage	tons	803	903	903
Corn purchased	bu.	3047	2779	2779
Corn sold	bu.	0	0	0
Hay baled	tons	67	36	36
Capital:				
Operating capital borrowed	$	34,000	34,171	34,171
MVP for operating capital	$	.23	.55	.55
Long-term capital borrowed	$	33,338	35,427	35,427
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	.78	1.88	1.88
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs./yr.	0	60	60
MVP for cropland	$/acre	62.99	77.15	77.15
Income	$	24,927	28,354	31,716

Table 65. Optimum organization of the grade A dairy farm in the Carrington-Clyde soil area (Farm I-1) at selected prices for milk and hog price $17.10 per cwt.

	Unit	Milk price per cwt. $0-3.55	$3.60	$4.00	$4.40
Crop enterprises:					
Cont. corn	acres	171	46	46	17
CCOM	acres	47	0	0	0
COMM	acres	54	226	226	255
Livestock enterprises:					
Cows milked	cows	0	40	40	57
Milk sold	cwt.	0	4360	4360	6218
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	54	31	31	16
One-litter hog system	sows	23	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	17
Hogs	sows	61	15	15	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	14,686	6,952	6,952	4,252
Corn harvested for silage	tons	0	83	83	298
Corn purchased	bu.	0	2381	2381	2880
Corn sold	bu.	0	0	0	0
Hay baled	tons	122	145	145	147
Capital:					
Operating capital borrowed	$	14,248	23,956	23,956	28,405
MVP for operating capital	$	.31	.24	.24	.26
Long-term capital borrowed	$	17,237	4,249	4,249	10,773
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	1.51	1.51	1.53
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0.85	4.80	4.80	1.67
Nov.-Dec.	$/hr.	0	0	0	1.53
Total hired labor used	hrs./yr.	0	85	85	114
MVP for cropland	$/acre	31.19	48.01	48.01	58.90
Income	$	20,918	21,114	22,858	25,122

Table 65 (Continued).

	Unit	Milk price per cwt. $4.80	$5.20
Crop enterprises:			
Cont. corn	acres	53	53
CCOM	acres	0	0
COMM	acres	219	219
Livestock enterprises:			
Cows milked	cows	78	78
Milk sold	cwt.	8491	8491
Dairy system	-	parlor	parlor
Two-litter hog system	sows	0	0
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	78	78
Hogs	sows	0	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	2738	2738
Corn harvested for silage	tons	903	903
Corn purchased	bu.	2779	2779
Corn sold	bu.	0	0
Hay baled	tons	36	36
Capital:			
Operating capital borrowed	$	34,171	34,171
MVP for operating capital	$	.55	.55
Long-term capital borrowed	$	35,427	35,427
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	1.88	1.88
Nov.-Dec.	$/hr.	0	0
Total hired labor used	hrs./hr.	60	60
MVP for cropland	$/acre	77.15	77.15
Income	$	28,354	31,716

Table 66. Optimum organization of the grade A dairy farm in the Carrington-Clyde soil area (Farm I-1) at selected prices for milk and hog price $18.60 per cwt.

		Milk price per cwt.			
	Unit	$0-3.67	$4.00	$4.40	$4.80
Crop enterprises:					
Cont. corn	acres	171	56	56	26
CCOM	acres	46	0	0	0
COMM	acres	55	216	226	246
Livestock enterprises:					
Cows milked	cows	0	34	40	52
Milk sold	cwt.	0	3665	4360	5622
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	54	37	32	21
One-litter hog system	sows	23	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	Head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	12
Hogs	sows	61	21	16	5
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	14,686	7,912	6,903	5,070
Corn harvested for silage	tons	0	0	81	227
Corn purchased	bu.	0	2,317	2,494	2,815
Corn sold	bu.	0	0	0	0
Hay baled	tons	0	145	146	147
Capital:					
Operating capital borrowed	$	14,248	22,602	24,222	27,165
MVP for operating capital	$	.31	.39	.42	.46
Long-term capital borrowed	$	17,237	5,948	4,350	7,893
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	1.68	1.71	1.77
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0.85	7.18	5.51	2.50
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	87	88	89
MVP for cropland	$/acre	31.19	48.20	54.93	67.04
Income	$	23,555	24,766	26,480	28,576

Table 66 (Continued).

	Unit	Milk price per cwt. $5.20
Crop enterprises:		
Cont. corn	acres	53
CCOM	acres	0
COMM	acres	219
Livestock enterprises:		
Cows milked	cows	78
Milk sold	cwt.	8491
Dairy system	-	parlor
Two-litter hog system	sows	0
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	78
Hogs	sows	0
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	2,738
Corn harvested for silage	tons	903
Corn purchased	bu.	2,779
Corn sold	bu.	0
Hay baled	tons	36
Capital:		
Operating capital borrowed	$	34,172
MVP for operating capital	$	.59
Long-term capital borrowed	$	35,427
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	1.99
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	60
MVP for cropland	$/acre	78.68
Income	$	31,716

Table 67. Optimum organization of the small non-dairy farm in the Carrington-Clyde soil area (Farm I-2) at selected prices for milk and hog price $11.10 and $12.60 per cwt.

	Unit	Milk price per cwt. $0-3.55	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	74	3	0
CCOM	acres	0	0	0
COMM	acres	2	73	76
Livestock enterprises:				
Cows milked	cows	0	18	21
Milk sold	cwt.	0	1984	2314
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	93	0	0
Facilities added for:				
Dairy	cows	0	0	0
Hogs	sows	0	0	0
Beef	A.U.	43	0	0
Feed:				
Corn harvested for grain	bu.	4055	1160	656
Corn harvested for silage	tons	206	75	135
Corn purchased	bu.	0	0	751
Corn sold	bu.	0	0	0
Hay baled	tons	3	54	47
Capital:				
Operating capital borrowed	$	12,693	5,263	7,356
MVP for operating capital	$	.07	.07	.07
Long-term capital borrowed	$	7,886	10,948	13,746
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.29	1.29
Apr.-May	$/hr.	0	0	1.29
Jun.-Jul.	$/hr.	0	0	1.29
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	0	0
Nov.-Dec.	$/hr.	0	1.29	1.29
Total hired labor used	hrs./yr.	0	99	218
MVP for cropland	$/acre	54.83	54.19	52.81
Income	$	4,781	5,151	6,017

Table 68. Optimum organization of the small non-dairy farm in the Carrington-Clyde soil area (Farm I-2) at selected prices for milk and hog price $14.10 per cwt.

	Unit	Milk price per cwt. $0-3.56	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	74	3	0
CCOM	acres	0	0	0
COMM	acres	2	73	76
Livestock enterprises:				
Cows milked	cows	0	18	21
Milk sold	cwt.	0	1984	2314
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	7	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	63	0	0
Facilities added for:				
Dairy	cows	0	0	0
Hogs	sows	0	0	0
Beef	A.U.	26	0	0
Feed:				
Corn harvested for grain	bu.	4335	1160	656
Corn harvested for silage	tons	155	75	135
Corn purchased	bu.	0	0	751
Corn sold	bu.	0	0	0
Hay baled	tons	3	54	47
Capital:				
Operating capital borrowed	$	9,213	5,263	7,356
MVP for operating capital	$	.07	.07	.07
Long-term capital borrowed	$	5,274	10,948	13,746
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.29	1.29
Apr.-May	$/hr.	0	0	1.29
Jun.-Jul.	$/hr.	0	0	1.29
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	0	0
Nov.-Dec.	$/hr.	0	0	1.29
Total hired labor used	hrs./yr.	0	129	218
MVP for cropland	$/acre	54.83	54.20	52.81
Income	$	4,807	5,151	6,017

Table 69. Optimum organization of the small non-dairy farm in the Carrington-Clyde soil area (Farm I-2) at selected prices for milk and hog price $15.60 per cwt.

		Milk price per cwt.	
	Unit	$0-4.09	$4.20
Crop enterprises:			
Cont. corn	acres	53	0
CCOM	acres	0	0
COMM	acres	23	76
Livestock enterprises:			
Cows milked	cows	0	21
Milk sold	cwt.	0	2243
Dairy system	-	-	stanchion
Two-litter hog system	sows	30	7
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	4	0
Facilities added for:			
Dairy	cows	0	21
Hogs	sows	23	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	4085	561
Corn harvested for silage	tons	10	151
Corn purchased	bu.	2970	2403
Corn sold	bu.	0	0
Hay baled	tons	0	38
Capital:			
Operating capital borrowed	$	7136	10,230
MVP for operating capital	$	.14	.07
Long-term capital borrowed	$	6546	13,746
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	1.29
Apr.-May	$/hr.	0	1.29
Jun.-Jul.	$/hr.	0	1.29
Aug.	$/hr.	0	1.29
Sept.-Oct.	$/hr.	1.38	1.29
Nov.-Dec.	$/hr.	0	1.29
Total hired labor used	hrs./yr.	0	428
MVP for cropland	$/acre	55.83	48.67
Income	$	5,872	6,008

Table 70. Optimum organization of the small non-dairy farm in the Carrington-Clyde soil area (Farm I-2) at selected prices for milk and hog price $17.10 per cwt.

	Unit	Milk price per cwt. $0-4.20
Crop enterprises:		
Cont. corn	acres	52
CCOM	acres	0
COMM	acres	24
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	32
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	25
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	4066
Corn harvested for silage	tons	0
Corn purchased	bu.	3146
Corn sold	bu.	0
Hay baled	tons	0
Capital:		
Operating capital borrowed	$	7,074
MVP for operating capital	$	.28
Long-term capital borrowed	$	6,942
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	1.21
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	28
MVP for cropland	$/acre	67.62
Income	$	7,234

Table 71. Optimum organization of the small non-dairy farm in the Carrington-Clyde soil area (Farm I-2) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0-4.20
Crop enterprises:		
Cont. corn	acres	51
CCOM	acres	0
COMM	acres	25
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	32
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	25
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	4045
Corn harvested for silage	tons	0
Corn purchased	bu.	3257
Corn sold	bu.	0
Hay baled	tons	0
Capital:		
Operating capital borrowed	$	7349
MVP for operating capital	$	.47
Long-term capital borrowed	$	7053
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	1.21
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	30
MVP for cropland	$/acre	77.99
Income	$	9,159

Table 72. Optimum organization of the large non-dairy farm in the Carrington-Clyde soil area (Farm I-3) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

	Unit	Milk price per cwt.		
		$0-3.45	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	121	0	0
CCOM	acres	0	0	0
COMM	acres	114	235	235
Livestock enterprises:				
Cows milked	cows	0	62	62
Milk sold	cwt.	0	6813	6813
Dairy system	-	-	parlor	parlor
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	246	0	0
Facilities added for:				
Dairy	cows	0	62	62
Hogs	sows	0	0	0
Beef	A.U.	97	0	0
Feed:				
Corn harvested for grain	bu.	10,025	2,049	2,049
Corn harvested for silage	tons	96	413	413
Corn purchased	bu.	0	2,020	2,020
Corn sold	bu.	0	0	0
Hay baled	tons	177	133	133
Capital:				
Operating capital borrowed	$	37,586	26,667	26,667
MVP for operating capital	$	.07	.07	.07
Long-term capital borrowed	$	9,991	26,472	26,472
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.29	1.29
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	1.29	1.29
Aug.	$/hr.	0	1.29	1.29
Sept.-Oct.	$/hr.	.09	1.58	1.58
Nov.-Dec.	$/hr.	0	1.29	1.29
Total hired labor used	hrs./yr.	0	377	377
MVP for cropland	$/acre	54.82	49.01	49.01
Income	$	13,903	16,281	19,007

Table 73. Optimum organization of the large non-dairy farm in the Carrington-Clyde soil area (Farm I-3) at selected prices for milk and hog price $14.10 per cwt.

		Milk price per cwt.		
	Unit	$0-3.45	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	116	0	0
CCOM	acres	0	0	0
COMM	acres	119	235	235
Livestock enterprises:				
Cows milked	cows	0	62	62
Milk sold	cwt.	0	6813	6813
Dairy system	-	-	parlor	parlor
Two-litter hog system	sows	4	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	227	0	0
Facilities added for:				
Dairy	cows	0	62	62
Hogs	sows	0	0	0
Beef	A.U.	86	0	0
Feed:				
Corn harvested for grain	bu.	10,091	2,049	2,049
Corn harvested for silage	tons	41	413	413
Corn purchased	bu.	0	2,020	2,020
Corn sold	bu.	0	0	0
Hay baled	tons	184	133	133
Capital:				
Operating capital borrowed	$	35,288	26,667	26,667
MVP for operating capital	$	.07	.07	.07
Long-term capital borrowed	$	7,871	26,472	26,472
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.29	1.29
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	1.29	1.29
Aug.	$/hr.	0	1.29	1.29
Sept.-Oct.	$/hr.	.51	1.58	1.58
Nov.-Dec.	$/hr.	0	1.29	1.29
Total hired labor used	hrs./yr.	0	371	371
MVP for cropland	$/acre	53.78	49.01	49.01
Income	$	13,917	16,281	19,007

Table 74. Optimum organization of the large non-dairy farm in the Carrington-Clyde soil area (Farm I-3) at selected prices for milk and hog price $15.60 per cwt.

	Unit	Milk price per cwt. $0-3.96	$4.20
Crop enterprises:			
Cont. corn	acres	128	36
CCOM	acres	0	0
COMM	acres	107	199
Livestock enterprises:			
Cows milked	cows	0	39
Milk sold	cwt.	0	4203
Dairy system	-	-	stanchion
Two-litter hog system	sows	24	0
One-litter hog system	sows	5	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	146	0
Facilities added for:			
Dairy	cows	0	0
Hogs	sows	0	0
Beef	A.U.	41	0
Feed:			
Corn harvested for grain	bu.	10,930	5,974
Corn harvested for silage	tons	0	41
Corn purchased	bu.	1,023	0
Corn sold	bu.	0	1,203
Hay baled	tons	134	153
Capital:			
Operating capital borrowed	$	28,845	17,784
MVP for operating capital	$	0.11	0.07
Long-term capital borrowed	$	3,780	20,415
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	2.54
Apr.-May	$/hr.	0	1.29
Jun.-Jul.	$/hr.	0	1.29
Aug.	$/hr.	0	1.29
Sept.-Oct.	$/hr.	6.49	3.83
Nov.-Dec.	$/hr.	0	1.29
Total hired labor used	hrs./yr.	27	664
MVP for cropland	$/acre	37.76	34.46
Income	$	15,217	16,232

Table 75. Optimum organization of the large non-dairy farm in the Carrington-Clyde soil area (Farm I-3) at selected prices for milk and hog price $17.10 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	85
CCOM	acres	111
COMM	acres	39
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	29
One-litter hog system	sows	30
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	75
Facilities added for:		
Dairy	cows	0
Hogs	sows	30
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	10,718
Corn harvested for silage	tons	0
Corn purchased	bu.	1,772
Corn sold	bu.	0
Hay baled	tons	68
Capital:		
Operating capital borrowed	$	23,401
MVP for operating capital	$	0.16
Long-term capital borrowed	$	8,247
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	.42
Jun.-Jul.	$/hr.	1.40
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	9.34
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	168
MVP for cropland	$/acre	28.87
Income	$	17,248

Table 76. Optimum organization of the large non-dairy farm in the Carrington-Clyde soil area (Farm I-3) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	57
CCOM	acres	178
COMM	acres	0
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	34
One-litter hog system	sows	54
Beef cows	cows	3
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	59
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	10,473
Corn harvested for silage	tons	0
Corn purchased	bu.	2,515
Corn sold	bu.	0
Hay baled	tons	7
Capital:		
Operating capital borrowed	$	18,403
MVP for operating capital	$	0.17
Long-term capital borrowed	$	16,343
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	1.42
Apr.-May	$/hr.	3.91
Jun.-Jul.	$/hr.	1.42
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	12.10
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	413
MVP for cropland	$/acre	17.16
Income	$	20,676

Table 77. Optimum organization of the small dairy farm in the Carrington-Clyde soil area (Farm I-4) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

	Unit	Milk price per cwt.			
		$0-3.01	$3.40	$3.80	$4.20
Crop enterprises:					
Cont. corn	acres	94	61	6	3
CCOM	acres	0	0	0	0
COMM	acres	3	36	91	94
Livestock enterprises:					
Cows milked	cows	0	18	32	34
Milk sold	cwt.	0	1962	3544	3660
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	119	39	15	0
Facilities added for:					
Dairy	cows	0	0	14	16
Hogs	sows	0	0	0	0
Beef	A.U.	58	12	0	0
Feed:					
Corn harvested for grain	bu.	5162	3046	0	0
Corn harvested for silage	tons	266	338	378	350
Corn purchased	bu.	0	0	2953	2383
Corn sold	bu.	0	0	0	0
Hay baled	tons	411	0	28	29
Capital:					
Operating capital borrowed	$	18,151	12,872	17,586	15,137
MVP for operating capital	$	.07	.07	.09	.07
Long-term capital borrowed	$	9,440	6,730	14,109	14,109
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	1.32	1.29
Total hired labor used	hrs./yr.	0	0	16	1
MVP for cropland	$/acre	54.83	55.20	57.30	59.94
Income	$	6,001	6,770	7,961	9,401

Table 78. Optimum organization of the small dairy farm in the Carrington-Clyde soil area (Farm I-4) at selected prices for milk and hog price $14.10 per cwt.

		Milk price per cwt.			
	Unit	$0-3.01	$3.40	$3.80	$4.20
Crop enterprises:					
Cont. corn	acres	94	57	6	3
CCOM	acres	0	0	0	0
COMM	acres	3	40	91	94
Livestock enterprises:					
Cows milked	cows	0	18	32	34
Milk sold	cwt.	0	1962	3544	3560
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	12	4	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	66	18	15	0
Facilities added for:					
Dairy	cows	0	0	14	16
Hogs	sows	0	0	0	0
Beef	A.U.	28	0	0	0
Feed:					
Corn harvested for grain	bu.	5642	3131	0	0
Corn harvested for silage	tons	179	281	378	350
Corn purchased	bu.	0	0	2953	2383
Corn sold	bu.	0	0	0	0
Hay baled	tons	0	0	28	29
Capital:					
Operating capital borrowed	$	12,184	10,380	17,586	15,137
MVP for operating capital	$	.07	.07	.09	.07
Long-term capital borrowed	$	4,964	4,479	14,109	14,109
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	1.32	1.29
Total hired labor used	hrs./yr.	0	0	16	1
MVP for cropland	$/acre	54.83	56.06	57.30	59.94
Income	$	6,046	6,787	7,961	9,401

Table 79. Optimum organization of the small dairy farm in the Carrington-Clyde soil area (Farm I-4) at selected prices for milk and hog price $15.60 per cwt.

	Unit	Milk price per cwt. $0-3.29	$3.40	$3.80	$4.20
Crop enterprises:					
Cont. corn	acres	78	44	34	22
CCOM	acres	0	0	0	0
COMM	acres	19	53	63	75
Livestock enterprises:					
Cows milked	cows	0	18	24	31
Milk sold	cwt.	0	1962	2595	3422
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	28	17	12	5
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	18	0	0	0
Facilities added for:					
Dairy	cows	0	0	6	13
Hogs	sows	16	5	0	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	5530	2736	1825	638
Corn harvested for silage	tons	48	234	309	407
Corn purchased	bu.	1661	2466	2659	2894
Corn sold	bu.	0	0	0	0
Hay baled	tons	0	0	0	0
Capital:					
Operating capital borrowed	$	9,141	12,276	13,845	15,887
MVP for operating capital	$	0.16	0.16	0.16	0.16
Long-term capital borrowed	$	4,559	4,934	8,111	14,109
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	1.41
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	1.41
Total hired labor used	hrs./yr.	0	0	0	16
MVP for cropland	$/acre	61.42	61.42	61.42	61.45
Income	$	7,262	7,559	8,371	9,547

Table 80. Optimum organization of the small dairy farm in the Carrington-Clyde soil area (Farm I-4) at selected prices for milk and hog price $17.10 per cwt.

	Unit	Milk price per cwt. $0-3.77	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	73	43	43
CCOM	acres	0	0	0
COMM	acres	24	54	54
Livestock enterprises:				
Cows milked	cows	0	18	18
Milk sold	cwt.	0	1962	1962
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	33	17	17
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	0	0	0
Hogs	sows	21	5	5
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	5539	2724	2724
Corn harvested for silage	tons	0	234	234
Corn purchased	bu.	1983	2525	2525
Corn sold	bu.	0	0	0
Hay baled	tons	0	0	0
Capital:				
Operating capital borrowed	$	7715	12,433	12,433
MVP for operating capital	$	0.34	0.34	0.34
Long-term capital borrowed	$	5920	4993	4993
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	0	0
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs./yr.	0	0	0
MVP for cropland	$/acre	71.56	71.56	71.56
Income	$	9,187	9,364	10,145

Table 81. Optimum organization of the small dairy farm in the Carrington-Clyde soil area (Farm I-4) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	73
CCOM	acres	0
COMM	acres	24
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	34
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	21
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	5516
Corn harvested for silage	tons	0
Corn purchased	bu.	2099
Corn sold	bu.	0
Hay baled	tons	0
Capital:		
Operating capital borrowed	$	8005
MVP for operating capital	$	0.49
Long-term capital borrowed	$	6029
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	0
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	0
MVP for cropland	$/acre	82.93
Income	$	11,105

Table 82. Optimum organization of the large dairy farm in the Carrington-Clyde soil area (Farm I-5) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

		Milk price per cwt.			
	Unit	$0-2.40	$2.60	$3.00	$3.40
Crop enterprises:					
Cont. corn	acres	192	59	66	66
CCOM	acres	0	0	0	0
COMM	acres	5	138	131	131
Livestock enterprises:					
Cows milked	cows	0	17	19	19
Milk sold	cwt.	0	1826	2071	2071
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	3	0	0	0
Medium yearlings	head	17	129	123	123
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	0	0	0	0
Beef	A.U.	0	63	59	59
Feed:					
Corn harvested for grain	bu.	13,500	6,243	6,222	6,222
Corn harvested for silage	tons	0	75	150	150
Corn purchased	bu.	0	0	0	0
Corn sold	bu.	12,620	0	0	0
Hay baled	tons	8.2	164.3	143.6	143.6
Capital:					
Operating capital borrowed	$	6,612	26,860	26,915	26,915
MVP for operating capital	$	0.80	0.63	0.09	0.09
Long-term capital borrowed	$	41	5,697	6,888	6,888
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	0	0	0
MVP for cropland	$/acre	29.08	36.32	54.51	54.51
Income	$	10,461	10,793	11,515	12,243

Table 82 (Continued).

	Unit	Milk price per cwt. $3.80	$4.20
Crop enterprises:			
Cont. corn	acres	0	0
CCCM	acres	0	0
COMM	acres	197	197
Livestock enterprises:			
Cows milked	cows	52	52
Milk sold	cwt.	5665	5665
Dairy system	-	parlor	parlor
Two-litter hog system	sows	0	0
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	52	52
Hogs	sows	0	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	1,841	1,841
Corn harvested for silage	tons	324	324
Corn purchased	bu.	1,530	1,530
Corn sold	bu.	0	0
Hay baled	tons	117	117
Capital:			
Operating capital borrowed	$	22,440	22,440
MVP for operating capital	$	0.07	0.07
Long-term capital borrowed	$	22,286	22,286
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	0	0
Nov.-Dec.	$/hr.	0	0
Total hired labor used	hrs./yr.	0	0
MVP for cropland	$/acre	62.97	62.97
Income	$	14,469	16,235

Table 83. Optimum organization of the large dairy farm in the Carrington-Clyde soil area (Farm I-5) at selected prices for milk and hog price $14.10 per cwt.

		Milk price per cwt.			
	Unit	$0-2.38	$2.60	$3.00	$3.40
Crop enterprises:					
Cont. corn	acres	166	79	68	68
CCOM	acres	0	0	0	0
COMM	acres	31	118	129	129
Livestock enterprises:					
Cows milked	cows	0	11	19	19
Milk sold	cwt.	0	1196	2071	2071
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	16	16	12	12
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	10	0	0	0
Medium yearlings	head	9	88	71	71
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	0	0	0	0
Beef	A.U.	0	39	29	29
Feed:					
Corn harvested for grain	bu.	12,172	7,720	6,745	6,745
Corn harvested for silage	tons	0	0	75	75
Corn purchased	bu.	0	0	0	0
Corn sold	bu.	7,686	0	0	0
Hay baled	tons	16	129	122	122
Capital:					
Operating capital borrowed	$	8,020	21,262	21,079	21,079
MVP for operating capital	$	0.92	0.47	0.07	0.07
Long-term capital borrowed	$	0	3,567	2,686	2,686
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	1.35	.51	.51
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	0	0	0
MVP for cropland	$/acre	28.50	38.28	53.78	53.78
Income	$	10,692	10,947	11,573	12,243

Table 83 (Continued).

	Unit	Milk price per cwt. $3.80	$4.20
Crop enterprises:			
Cont. corn	acres	0	0
CCOM	acres	0	0
COMM	acres	197	197
Livestock enterprises:			
Cows milked	cows	52	52
Milk sold	cwt.	5665	5665
Dairy system	-	parlor	parlor
Two-litter hog system	sows	0	0
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	52	52
Hogs	sows	0	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	1,841	1,841
Corn harvested for silage	tons	324	324
Corn purchased	bu.	1,530	1,530
Corn sold	bu.	0	0
Hay baled	tons	117	117
Capital:			
Operating capital borrowed	$	22,440	22,440
MVP for operating capital	$	0.07	0.07
Long-term capital borrowed	$	22,286	22,286
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	0	0
Nov.-Dec.	$/hr.	0	0
Total hired labor used	hrs./yr.	0	0
MVP for cropland	$/acre	77.19	77.19
Income	$	14,469	16,235

Table 84. Optimum organization of the large dairy farm in the Carrington-Clyde soil area (Farm I-5) at selected prices for milk and hog price $15.60 per cwt.

		Milk price per cwt.			
	Unit	$0-3.06	$3.40	$3.80	$4.20
Crop enterprises:					
Cont. corn	acres	85	61	26	0
CCOM	acres	112	0	0	0
COMM	acres	0	136	171	197
Livestock enterprises:					
Cows milked	cows	0	20	34	51
Milk sold	cwt.	0	2232	3672	5608
Dairy system	-	-	stanchion	stanchion	parlor
Two-litter hog system	sows	41	26	17	4
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	7	0	0	0
Medium yearlings	head	19	19	0	0
Facilities added for:					
Dairy	cows	0	1	15	51
Hogs	sows	25	10	1	0
Beef	A.U.	4	0	0	0
Feed:					
Corn harvested for grain	bu.	10,038	6,767	4,585	1,819
Corn harvested for silage	tons	0	0	75	329
Corn purchased	bu.	0	965	1,295	2,325
Corn sold	bu.	0	0	0	0
Hay baled	tons	23	106	121	113
Capital:					
Operating capital borrowed	$	12,001	17,173	18,119	23,646
MVP for operating capital	$	0.54	0.09	0.07	0.25
Long-term capital borrowed	$	7,359	3,475	8,091	22,286
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	1.29	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	1.29	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	5.83	4.48	1.27	0
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	52	52	68	0
MVP for cropland	$/acre	25.27	43.27	50.00	66.13
Income	$	12,736	13,430	14,483	16,369

Table 85. Optimum organization of the large dairy farm in the Carrington-Clyde soil area (Farm I-5) at selected prices for milk and hog price $17.10 per cwt.

		Milk price per cwt.		
	Unit	$0-3.58	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	127	49	44
CCOM	acres	37	0	0
COMM	acres	33	148	153
Livestock enterprises:				
Cows milked	cows	0	25	29
Milk sold	cwt.	0	2225	3203
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	37	27	23
One-litter hog system	sows	24	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	0	6	10
Hogs	sows	45	11	7
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	10,849	6,144	5,466
Corn harvested for silage	tons	0	0	75
Corn purchased	bu.	0	1,385	1,469
Corn sold	bu.	0	0	0
Hay baled	tons	0	106	102
Capital:				
Operating capital borrowed	$	11,618	16,611	17,866
MVP for operating capital	$	0.38	0.13	0.17
Long-term capital borrowed	$	12,464	6,069	7,417
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.37	1.41
Apr.-May	$/hr.	0	0	1.41
Jun.-Jul.	$/hr.	0	1.37	1.41
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	8.59	8.62	4.25
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs./yr.	52	91	113
MVP for cropland	$/acre	32.20	29.86	44.23
Income	$	15,399	15,944	17,049

Table 86. Optimum organization of the large dairy farm in the Carrington-Clyde soil area (Farm I-5) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0-4.11	$4.20
Crop enterprises:			
Cont. corn	acres	143	48
CCOM	acres	0	0
COMM	acres	54	149
Livestock enterprises:			
Cows milked	cows	0	25
Milk sold	cwt.	0	2696
Dairy system	-	-	stanchion
Two-litter hog system	sows	35	27
One-litter hog system	sows	28	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	0	6
Hogs	sows	47	11
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	10,989	6,093
Corn harvested for silage	tons	0	0
Corn purchased	bu.	134	1,481
Corn sold	bu.	0	0
Hay baled	tons	0	106
Capital:			
Operating capital borrowed	$	12,397	16,880
MVP for operating capital	$	0.39	0.29
Long-term capital borrowed	$	13,124	6,196
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	1.56
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	1.56
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	9.11	9.47
Nov.-Dec.	$/hr.	0	0
Total hired labor used	hrs./hr.	52	98
MVP for cropland	$/acre	44.85	35.70
Income	$	18,420	18,656

Table 87. Optimum organization of the grade A dairy farm in the Fayette soil area (Farm II-1) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

	Unit	Milk price per cwt. $0-3.01	$3.20	$3.60	$4.00
Crop enterprises:					
Cont. corn	acres	90	42	35	0
CCOM	acres	0	0	0	0
COMM	acres	83	131	138	173
Livestock enterprises:					
Cows milked	cows	0	39	41	53
Milk sold	cwt.	0	4275	4469	5802
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	183	18	18	0
Facilities added for:					
Dairy	cows	0	0	0	12
Hogs	sows	0	0	0	0
Beef	A.U.	94	0	0	0
Feed:					
Corn harvested for grain	bu.	7,469	3,280	2,835	465
Corn harvested for silage	tons	84	391	402	500
Corn purchased	bu.	0	170	728	3,207
Corn sold	bu.	0	0	0	0
Hay baled	tons	138	55	59	64
Capital:					
Operating capital borrowed	$	25,950	16,270	17,490	22,045
MVP for operating capital	$	0.07	0.07	0.07	0.07
Long-term capital borrowed	$	9,275	6,875	7,090	15,528
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	.41	.41	1.29
Nov.-Dec.	$/hr.	0	0	1.29	1.68
Total hired labor used	hrs./yr.	0	0	20	158
MVP for cropland	$/acre	54.89	55.86	55.86	55.59
Income	$	10,371	11,181	12,945	15,085

Table 87 (Continued).

	Unit	Milk price per cwt. $4.40	$4.80	$5.20
Crop enterprises:				
Cont. corn	acres	0	0	0
CCOM	acres	0	0	0
COMM	acres	173	173	173
Livestock enterprises:				
Cows milked	cows	53	53	53
Milk sold	cwt.	5802	5802	5802
Dairy system	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	12	12	12
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	465	465	465
Corn harvested for silage	tons	500	500	500
Corn purchased	bu.	3,207	3,207	3,207
Corn sold	bu.	0	0	0
Hay baled	tons	64	64	64
Capital:				
Operating capital borrowed	$	22,045	22,045	22,045
MVP for operating capital	$	0.07	0.07	0.07
Long-term capital borrowed	$	15,528	15,528	15,528
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	1.29	1.29	1.29
Nov.-Dec.	$/hr.	1.68	1.68	1.68
Total hired labor used	hrs./yr.	158	158	158
MVP for cropland	$/acre	55.59	55.59	55.59
Income	$	17,406	19,737	22,048

Table 88. Optimum organization of the grade A dairy farm in the Fayette soil area (Farm II-1) at selected prices for milk and hog price $14.10 per cwt.

	Unit	Milk price per cwt. $0-2.96	$3.20	$3.60	$4.00
Crop enterprises:					
Cont. corn	acres	90	42	35	0
CCOM	acres	0	0	0	0
COMM	acres	83	131	138	173
Livestock enterprises:					
Cows milked	cows	0	39	41	53
Milk sold	cwt.	0	4275	4469	5802
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	11	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	151	18	18	0
Facilities added for:					
Dairy	cows	0	0	0	12
Hogs	sows	0	0	0	0
Beef	A.U.	76	0	0	0
Feed:					
Corn harvested for grain	bu.	7,658	3,280	2,835	465
Corn harvested for silage	tons	50	391	402	500
Corn purchased	bu.	991	170	728	3,207
Corn sold	bu.	0	0	0	0
Hay baled	tons	120	55	59	64
Capital:					
Operating capital borrowed	$	24,039	16,270	17,490	22,045
MVP for operating capital	$	0.07	0.07	0.07	0.07
Long-term capital borrowed	$	6,972	6,875	7,090	15,528
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	.42	.42	1.29
Nov.-Dec.	$/hr.	0	0	1.29	1.64
Total hired labor used	hrs./yr.	0	0	20	158
MVP for cropland	$/acre	53.47	55.87	55.87	55.60
Income	$	10,392	11,181	12,945	15,085

Table 88 (Continued).

	Unit	Milk price per cwt. $4.40	$4.80	$5.20
Crop enterprises:				
Cont. corn	acres	0	0	0
CCOM	acres	0	0	0
COMM	acres	173	173	173
Livestock enterprises:				
Cows milked	cows	53	53	53
Milk sold	cwt.	5802	5802	5802
Dairy system	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	12	12	12
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	465	465	465
Corn harvested for silage	tons	500	500	500
Corn purchased	bu.	3207	3207	3207
Corn sold	bu.	0	0	0
Hay baled	tons	64	64	64
Capital:				
Operating capital borrowed	$	22,045	22,045	22,045
MVP for operating capital	$	0.07	0.07	0.07
Long-term capital borrowed	$	15,528	15,528	15,528
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	1.29	1.29	1.29
Nov.-Dec.	$/hr.	1.64	1.64	1.29
Total hired labor used	hrs./yr.	158	158	158
MVP for cropland	$/acre	55.60	55.60	55.60
Income	$	17,406	19,737	22,048

Table 89. Optimum organization of the grade A dairy farm in the Fayette soil area (Farm II-1) at selected prices for milk and hog price $15.60 per cwt.

		Milk price per cwt.			
	Unit	$0-2.71	$3.20	$3.60	$4.00
Crop enterprises:					
Cont. corn	acres	48	90	2	2
CCOM	acres	125	0	0	0
COMM	acres	0	83	171	171
Livestock enterprises:					
Cows milked	cows	0	11	41	41
Milk sold	cwt.	0	1177	4469	4469
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	44	42	14	14
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	10	0	0	0
Medium yearlings	head	8	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	24	22	0	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	8,040	7,654	1,840	1,840
Corn harvested for silage	tons	0	50	274	274
Corn purchased	bu.	2,372	2,400	3,987	3,987
Corn sold	bu.	0	0	0	0
Hay baled	tons	15	30	86	86
Capital:					
Operating capital borrowed	$	10,468	12,220	20,241	20,241
MVP for operating capital	$	0.22	0.15	0.20	0.20
Long-term capital borrowed	$	6,798	6,011	4,520	4,520
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	1.39	0.88	0.88
Nov.-Dec.	$/hr.	0	0	1.45	1.45
Total hired labor used	hrs./yr.	0	0	85	85
MVP for cropland	$/acre	35.21	51.09	61.69	61.69
Income	$	11,851	12,325	13,553	15,341

Table 89 (Continued).

	Unit	Milk price per cwt. $4.40	$4.80	$5.20
Crop enterprises:				
Cont. corn	acres	0	0	0
CCOM	acres	0	0	0
COMM	acres	173	173	173
Livestock enterprises:				
Cows milked	cows	53	53	53
Milk sold	cwt.	5802	5802	5802
Dairy system	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	12	12	12
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	458	458	458
Corn harvested for silage	tons	500	500	500
Corn purchased	bu.	3,214	3,214	3,214
Corn sold	bu.	0	0	0
Hay baled	tons	63	63	63
Capital:				
Operating capital borrowed	$	22,048	22,048	22,048
MVP for operating capital*	$	0.07	0.07	0.07
Long-term capital borrowed	$	15,553	15,553	15,553
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	1.29	1.29	1.29
Nov.-Dec.	$/hr.	6.93	6.93	6.93
Total hired labor used	hrs./yr.	158	158	158
MVP for cropland	$/acre	55.61	55.61	55.61
Income	$	17,406	19,737	22,048

Table 90. Optimum organization of the grade A dairy farm in the Fayette soil area (Farm II-1) at selected prices for milk and hog price $17.10 per cwt.

		Milk price per cwt.			
	Unit	$0-3.13	$3.20	$3.60	$4.00
Crop enterprises:					
Cont. corn	acres	48	90	90	13
CCOM	acres	124	0	0	0
COMM	acres	0	83	83	160
Livestock enterprises:					
Cows milked	cows	0	7	11	34
Milk sold	cwt.	0	731	1164	3760
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	49	46	42	20
One-litter hog system	sows	0	0	0	0
Beef cows	cows	5	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	29	26	22	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	8,040	7,932	7,654	2,858
Corn harvested for silage	tons	0	0	50	189
Corn purchased	bu.	2,457	2,498	2,532	3,856
Corn sold	bu.	0	0	0	0
Hay baled	tons	13	35	30	86
Capital:					
Operating capital borrowed	$	9,996	11,744	12,574	18,683
MVP for operating capital	$	0.40	0.36	0.34	0.29
Long-term capital borrowed	$	7,971	7,133	6,181	2,793
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	1.65	1.63	1.20
Nov.-Dec.	$/hr.	0	0	0	1.56
Total hired labor used	hrs./yr.	0	100	113	52
MVP for cropland	$/acre	33.23	49.65	56.34	65.71
Income	$	14,574	14,902	15,276	16,248

Table 90 (Continued).

	Unit	Milk price per cwt. $4.40	$4.80	$5.20
Crop enterprises:				
Cont. corn	acres	2	0	0
CCOM	acres	0	0	0
COMM	acres	171	173	173
Livestock enterprises:				
Cows milked	cows	41	49	52
Milk sold	cwt.	4469	5330	5683
Dairy system	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	14	7	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	0	8	11
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	1,822	865	404
Corn harvested for silage	tons	273	427	510
Corn purchased	bu.	4,038	4,078	4,081
Corn sold	bu.	0	0	0
Hay baled	tons	86	69	55
Capital:				
Operating capital borrowed	$	20,368	22,446	23,721
MVP for operating capital	$	0.37	0.36	0.21
Long-term capital borrowed	$	4,491	11,785	15,167
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	1.49	1.65	1.47
Nov.-Dec.	$/hr.	1.66	1.65	8.78
Total hired labor used	hrs./yr.	86	163	157
MVP for cropland	$/acre	69.26	69.02	62.10
Income	$	17,977	19,964	22,165

Table 91. Optimum organization of the grade A dairy farm in the Fayette soil area (Farm II-1) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0-3.56	$3.60	$4.00	$4.40
Crop enterprises:					
Cont. corn	acres	48	90	90	52
CCOM	acres	125	0	0	0
COMM	acres	0	83	83	121
Livestock enterprises:					
Cows milked	cows	0	7	11	36
Milk sold	cwt.	0	720	1151	3893
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	49	46	43	20
One-litter hog system	sows	0	0	0	0
Beef cows	cows	5	0	0	0
Deferred fed calves	head	4	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	29	26	23	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	8,040	7,932	7,655	3,751
Corn harvested for silage	tons	0	0	50	393
Corn purchased	bu.	2,457	2,645	2,667	3,298
Corn sold	bu.	0	0	0	0
Hay baled	tons	14	34	29	23
Capital:					
Operating capital borrowed	$	9,996	12,106	12,907	19,273
MVP for operating capital	$	0.40	0.55	0.53	0.46
Long-term capital borrowed	$	7,971	7,318	6,359	6,920
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	1.88	1.85	1.82
Nov.-Dec.	$/hr.	0	0	0	1.77
Total hired labor used	hrs./yr.	0	104	117	194
MVP for cropland	$/acre	33.23	56.79	64.67	73.43
Income	$	17,410	17,974	18,297	18,981

Table 91 (Continued).

	Unit	Milk price per cwt. $4.80	$5.20
Crop enterprises:			
Cont. corn	acres	43	32
CCOM	acres	0	0
COMM	acres	130	141
Livestock enterprises:			
Cows milked	cows	41	48
Milk sold	cwt.	4469	5224
Dairy system	-	stanchion	stanchion
Two-litter hog system	sows	15	9
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	0	6
Hogs	sows	0	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	2,914	1,819
Corn harvested for silage	tons	462	553
Corn purchased	bu.	3,428	3,599
Corn sold	bu.	0	0
Hay baled	tons	23	23
Capital:			
Operating capital borrowed	$	20,603	22,345
MVP for operating capital	$	0.54	0.54
Long-term capital borrowed	$	8,310	13,795
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	2.11	2.11
Nov.-Dec.	$/hr.	1.87	1.87
Total hired labor used	hrs./yr.	221	256
MVP for cropland	$/acre	77.03	77.03
Income	$	20,630	22,520

Table 92. Optimum organization of the small non-dairy farm in the Fayette soil area (Farm II-2) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

		Milk price per cwt.		
	Unit	$0-3.49	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	38	29	0
CCOM	acres	0	0	0
COMM	acres	35	44	73
Livestock enterprises:				
Cows milked	cows	0	19	23
Milk sold	cwt.	0	2086	2463
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	79	17	0
Facilities added for:				
Dairy	cows	0	19	23
Hogs	sows	0	0	0
Beef	A.U.	26	0	0
Feed:				
Corn harvested for grain	bu.	3,252	1,317	318
Corn harvested for silage	tons	13	278	187
Corn purchased	bu.	0	866	1,246
Corn sold	bu.	0	0	0
Hay baled	tons	52	6	35
Capital:				
Operating capital borrowed	$	11,923	10,984	9,831
MVP for operating capital	$	0.07	0.07	0.07
Long-term capital borrowed	$	2,648	15,740	15,740
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	.52	1.29
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	.42	0
Nov.-Dec.	$/hr.	0	1.29	1.29
Total hired labor used	hrs./yr.	0	4	21
MVP for cropland	$/acre	54.88	55.87	57.21
Income	$	4,625	5,176	6,116

Table 93. Optimum organization of the small non-dairy farm in the Fayette soil area (Farm II-2) at selected prices for milk and hog price $14.10 per cwt.

		Milk price per cwt.		
	Unit	$0-3.52	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	38	29	0
CCOM	acres	0	0	0
COMM	acres	35	44	73
Livestock enterprises:				
Cows milked	cows	0	19	23
Milk sold	cwt.	0	2086	2463
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	8	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	60	17	0
Facilities added for:				
Dairy	cows	0	19	23
Hogs	sows	0	0	0
Beef	A.U.	15	0	0
Feed:				
Corn harvested for grain	bu.	3,322	1,317	318
Corn harvested for silage	tons	0	278	187
Corn purchased	bu.	1,010	866	1,246
Corn sold	bu.	0	0	0
Hay baled	tons	52	6	35
Capital:				
Operating capital borrowed	$	11,459	10,984	9,831
MVP for operating capital	$	0.08	0.07	0.07
Long-term capital borrowed	$	1,409	15,740	15,740
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	.52	1.29
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	.42	0
Nov.-Dec.	$/hr.	0	1.29	1.29
Total hired labor used	hrs./yr.	0	4	21
MVP for cropland	$/acre	52.54	55.87	57.22
Income	$	4,639	5,176	6,116

Table 94. Optimum organization of the small non-dairy farm in the Fayette soil area (Farm II-2) at selected prices for milk and hog price $15.60 per cwt.

	Unit	Milk price per cwt. $0-3.71	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	20	26	12
CCOM	acres	53	0	0
COMM	acres	0	47	61
Livestock enterprises:				
Cows milked	cows	0	8	21
Milk sold	cwt.	0	911	2289
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	17	17	6
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	2	0	0
Medium yearlings	head	24	0	0
Facilities added for:				
Dairy	cows	0	8	21
Hogs	sows	0	0	0
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	3,366	2,530	713
Corn harvested for silage	tons	0	30	229
Corn purchased	bu.	1,409	1,855	2,123
Corn sold	bu.	0	0	0
Hay baled	tons	23	26	14
Capital:				
Operating capital borrowed	$	8,045	7,893	11,295
MVP for operating capital	$	0.31	0.15	0.15
Long-term capital borrowed	$	0	5,029	15,740
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	1.39
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	.70	.70
Nov.-Dec.	$/hr.	0	0	1.39
Total hired labor used	hrs./yr.	0	0	90
MVP for cropland	$/acre	35.54	59.37	59.43
Income	$	5,473	6,007	6,272

Table 95. Optimum organization of small non-dairy farm in the Fayette soil area (Farm II-2) at selected prices for milk and hog price $17.10 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	20
CCOM	acres	0
COMM	acres	53
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	23
One-litter hog system	sows	0
Beef cows	cows	8
Deferred fed calves	head	6
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	6
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	3,365
Corn harvested for silage	tons	0
Corn purchased	bu.	1,699
Corn sold	bu.	0
Hay baled	tons	8
Capital:		
Operating capital borrowed	$	6,272
MVP for operating capital	$	0.47
Long-term capital borrowed	$	1,735
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	0
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	0
MVP for cropland	$/acre	33.89
Income	$	6,708

Table 96. Optimum organization of the small non-dairy farm in the Fayette soil area (Farm II-2) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	20
CCOM	acres	53
COMM	acres	0
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	24
One-litter hog system	sows	0
Beef cows	cows	12
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	7
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	3,366
Corn harvested for silage	tons	0
Corn purchased	bu.	1,766
Corn sold	bu.	0
Hay baled	tons	8
Capital:		
Operating capital borrowed	$	6,465
MVP for operating capital	$	0.75
Long-term capital borrowed	$	0
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	0
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	0
MVP for cropland	$/acre	37.01
Income	$	8,238

Table 97. Optimum organization of the large non-dairy farm in the Fayette soil area (Farm II-3) at selected prices for milk and hog prices $11.10 and $12.60 per cwt.

		Milk price per cwt.		
	Unit	$0-3.57	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	96	0	0
CCOM	acres	0	0	0
COMM	acres	94	190	190
Livestock enterprises:				
Cows milked	cows	0	47	47
Milk sold	cwt.	0	5146	5146
Dairy system	-	-	parlor	parlor
Two-litter hog system	sows	0	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	202	0	0
Facilities added for:				
Dairy	cows	0	47	47
Hogs	sows	0	0	0
Beef	A.U.	55	0	0
Feed:				
Corn harvested for grain	bu.	8,239	2,176	2,176
Corn harvested for silage	tons	62	249	249
Corn purchased	bu.	0	868	868
Corn sold	bu.	0	0	0
Hay baled	tons	140	121	121
Capital:				
Operating capital borrowed	$	30,124	18,649	18,649
MVP for operating capital	$	0.07	0.07	0.07
Long-term capital borrowed	$	5,689	20,998	20,998
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.29	1.29
Apr.-May	$/hr.	0	1.29	1.29
Jun.-Jul.	$/hr.	0	1.29	1.29
Aug.	$/hr.	0	1.29	1.29
Sept.-Oct.	$/hr.	.26	1.29	1.29
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs./yr.	0	311	311
MVP for cropland	$/acre	54.87	49.48	49.48
Income	$	11,843	13,023	15,081

Table 98. Optimum organization of the large non-dairy farm in the Fayette soil area (Farm II-3) at selected prices for milk and hog price $14.10 per cwt.

		Milk price per cwt.		
	Unit	$0-3.77	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	93	0	0
CCOM	acres	0	0	0
COMM	acres	97	190	190
Livestock enterprises:				
Cows milked	cows	0	47	47
Milk sold	cwt.	0	5146	5146
Dairy system	-	-	parlor	parlor
Two-litter hog system	sows	3	0	0
One-litter hog system	sows	0	0	0
Beef cows	cows	0	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	189	0	0
Facilities added for:				
Dairy	cows	0	41	47
Hogs	sows	0	0	0
Beef	A.U.	47	0	0
Feed:				
Corn harvested for grain	bu.	8,280	2,176	2,176
Corn harvested for silage	tons	26	249	249
Corn purchased	bu.	0	868	868
Corn sold	bu.	0	0	0
Hay baled	tons	145	121	121
Capital:				
Operating capital borrowed	$	28,607	18,649	18,649
MVP for operating capital	$	0.07	0.07	0.07
Long-term capital borrowed	$	4,308	20,998	20,998
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	1.29	1.29
Apr.-May	$/hr.	0	1.29	1.29
Jun.-Jul.	$/hr.	0	1.29	1.29
Aug.	$/hr.	0	1.29	1.29
Sept.-Oct.	$/hr.	.60	1.29	1.29
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs./yr.	0	311	311
MVP for cropland	$/acre	54.05	49.48	49.48
Income	$	11,851	13,023	15,081

Table 99. Optimum organization of the large non-dairy farm in the Fayette soil area (Farm II-3) at selected prices for milk and hog price $15.60 per cwt.

	Unit	Milk price per cwt. $0-4.10	$4.20
Crop enterprises:			
Cont. corn	acres	75	0
CCOM	acres	70	0
COMM	acres	45	190
Livestock enterprises:			
Cows milked	cows	0	47
Milk sold	cwt.	0	5097
Dairy system	-	-	parlor
Two-litter hog system	sows	28	0
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	106	0
Facilities added for:			
Dairy	cows	0	47
Hogs	sows	7	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	8,770	2,156
Corn harvested for silage	tons	0	253
Corn purchased	bu.	1,765	1,561
Corn sold	bu.	0	0
Hay baled	tons	96	118
Capital:			
Operating capital borrowed	$	22,446	19,814
MVP for operating capital	$	0.18	0.07
Long-term capital borrowed	$	2,090	20,998
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	0	1.29
Apr.-May	$/hr.	0	1.29
Jun.-Jul.	$/hr.	0	1.29
Aug.	$/hr.	0	1.29
Sept.-Oct.	$/hr.	1.42	1.29
Nov.-Dec.	$/hr.	0	1.29
Total hired labor used	hrs./yr.	153	404
MVP for cropland	$/acre	42.68	53.45
Income	$	12,997	15,081

Table 100. Optimum organization of the large non-dairy farm in the Fayette soil area (Farm II-3) at selected prices for milk and hog price $17.10 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	53
CCOM	acres	137
COMM	acres	0
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	44
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	8
Medium yearlings	head	33
Facilities added for:		
Dairy	cows	0
Hogs	sows	23
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	8,822
Corn harvested for silage	tons	0
Corn purchased	bu.	2,510
Corn sold	bu.	0
Hay baled	tons	36
Capital:		
Operating capital borrowed	$	16,012
MVP for operating capital	$	0.25
Long-term capital borrowed	$	6,500
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	1.52
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	7.13
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	253
MVP for cropland	$/acre	27.08
Income	$	15,343

Table 101. Optimum organization of the large non-dairy farm in the Fayette soil area (Farm II-3) at selected prices for milk and hog price $18.60 per cwt.

	Unit	Milk price per cwt. $0- 4.20
Crop enterprises:		
Cont. corn	acres	53
CCOM	acres	137
COMM	acres	0
Livestock enterprises:		
Cows milked	cows	0
Milk sold	cwt.	0
Dairy system	-	-
Two-litter hog system	sows	47
One-litter hog system	sows	14
Beef cows	cows	5
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	0
Hogs	sows	40
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	8,822
Corn harvested for silage	tons	0
Corn purchased	bu.	2,817
Corn sold	bu.	0
Hay baled	tons	13
Capital:		
Operating capital borrowed	$	14,390
MVP for operating capital	$	0.30
Long-term capital borrowed	$	11,095
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	1.57
Apr.-May	$/hr.	1.57
Jun.-Jul.	$/hr.	1.57
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	9.47
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	412
MVP for cropland	$/acre	23.22
Income	$	18,356

Table 102. Optimum organization of the small dairy farm in the Fayette soil area (Farm II-4) at selected prices for milk, and hog prices $11.10 and $12.60 per cwt.

		Milk price per cwt.			
	Unit	$0-3.00	$3.40	$3.80	$4.20
Crop enterprises:					
Cont. corn	acres	47	47	0	0
CCOM	acres	0	0	0	0
COMM	acres	44	44	91	91
Livestock enterprises:					
Cows milked	cows	0	16	29	29
Milk sold	cwt.	0	1744	3120	3120
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	104	41	9	9
Facilities added for:					
Dairy	cows	0	0	13	13
Hogs	sows	0	0	0	0
Beef	A.U.	49	16	0	0
Feed:					
Corn harvested for grain	bu.	2,955	2,955	429	429
Corn harvested for silage	tons	216	216	228	228
Corn purchased	bu.	0	0	1,942	1,942
Corn sold	bu.	0	0	0	0
Hay baled	tons	35	35	56	56
Capital:					
Operating capital borrowed	$	12,721	12,721	14,295	14,295
MVP for operating capital	$	0.15	0.07	0.07	0.07
Long-term capital borrowed	$	5,128	5,128	10,819	10,819
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	0	0	0
MVP for cropland	$/acre	42.38	54.89	59.41	59.41
Income	$	5,990	6,688	7,701	8,999

Table 103. Optimum organization of the small dairy farm in the Fayette soil area (Farm II-4) at selected prices for milk, and hog price $14.10 per cwt.

		Milk price per cwt.			
	Unit	$0-2.93	$3.00	$3.40	$3.80
Crop enterprises:					
Cont. corn	acres	43	47	47	0
CCOM	acres	13	0	0	0
COMM	acres	35	44	44	91
Livestock enterprises:					
Cows milked	cows	0	8	16	29
Milk sold	cwt.	0	889	1744	3120
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	14	5	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	104	18	18	9
Facilities added for:					
Dairy	cows	0	0	0	13
Hogs	sows	0	0	0	0
Beef	A.U.	49	0	0	0
Feed:					
Corn harvested for grain	bu.	4,164	4,025	3,171	430
Corn harvested for silage	tons	0	23	177	228
Corn purchased	bu.	80	432	0	1,942
Corn sold	bu.	0	0	0	0
Hay baled	tons	62	44	26	56
Capital:					
Operating capital borrowed	$	15,857	8,743	10,018	14,295
MVP for operating capital	$	0.15	0.07	0.07	0.11
Long-term capital borrowed	$	4,490	0	3,099	10,819
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	0	0	0
MVP for cropland	$/acre	42.37	53.44	55.50	59.41
Income	$	5,916	6,028	6,707	7,701

Table 103 (Continued).

	Unit	Milk price per cwt. $4.20
Crop enterprises:		
Cont. corn	acres	0
CCOM	acres	0
COMM	acres	91
Livestock enterprises:		
Cows milked	cows	29
Milk sold	cwt.	3120
Dairy system	-	stanchion
Two-litter hog system	sows	0
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	9
Facilities added for:		
Dairy	cows	13
Hogs	sows	0
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	430
Corn harvested for silage	tons	228
Corn purchased	bu.	1,942
Corn sold	bu.	0
Hay baled	tons	56
Capital:		
Operating capital borrowed	$	14,295
MVP for operating capital	$	0.11
Long-term capital borrowed	$	10,819
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	0
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	0
MVP for cropland	$/acre	59.41
Income	$	8,999

Table 104. Optimum organization of the small dairy farm in the Fayette soil area (Farm II-4) at selected prices for milk, and hog price $15.60 per cwt.

		Milk price per cwt.			
	Unit	$0-2.68	$3.00	$3.40	$3.80
Crop enterprises:					
Cont. corn	acres	26	47	47	47
CCOM	acres	65	0	0	0
COMM	acres	0	44	44	44
Livestock enterprises:					
Cows milked	cows	0	9	16	16
Milk sold	cwt.	0	967	1744	1774
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	20	20	14	14
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	16	0	0	0
Medium yearlings	head	1	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	6	6	0	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	4,207	4,025	3,206	3,174
Corn harvested for silage	tons	0	23	171	176
Corn purchased	bu.	1,007	1,131	1,233	1,237
Corn sold	bu.	0	0	0	0
Hay baled	tons	14	31	12	12
Capital:					
Operating capital borrowed	$	6,592	8,180	10,132	10,209
MVP for operating capital	$	0.24	0.19	0.17	0.17
Long-term capital borrowed	$	1,666	1,684	3,038	3,239
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./hr.	0	0	0	0
MVP for cropland	$/acre	35.29	50.80	59.67	59.67
Income	$	6,508	6,961	7,448	8,153

Table 104 (Continued)

	Unit	Milk price per cwt. $4.20
Crop enterprises:		
Cont. corn	acres	40
CCOM	acres	0
COMM	acres	51
Livestock enterprises:		
Cows milked	cows	25
Milk sold	cwt.	2722
Dairy system	-	stanchion
Two-litter hog system	sows	7
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	9
Hogs	sows	0
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	1,972
Corn harvested for silage	tons	324
Corn purchased	bu.	1,456
Corn sold	bu.	0
Hay baled	tons	0
Capital:		
Operating capital borrowed	$	12,584
MVP for operating capital	$	0.24
Long-term capital borrowed	$	10,819
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	0
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	0
MVP for cropland	$/acre	67.00
Income	$	9,063

Table 105. Optimum organization of the small dairy farm in the Fayette soil area (Farm II-4) at selected prices for milk, and hog price $17.10 per cwt.

		Milk price per cwt.			
—	Unit	$0-3.09	$3.40	$3.80	$4.20
Crop enterprises:					
Cont. corn	acres	25	47	47	15
CCOM	acres	66	0	0	0
COMM	acres	0	44	44	76
Livestock enterprises:					
Cows milked	cows	0	8	9	16
Milk sold	cwt.	0	784	967	1744
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	25	22	20	13
One-litter hog system	sows	0	0	0	0
Beef cows	cows	7	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	11	8	6	0
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	4,208	4,025	4,025	2,358
Corn harvested for silage	tons	0	23	23	23
Corn purchased	bu.	1,129	1,177	1,196	1,687
Corn sold	bu.	0	0	0	0
Hay baled	tons	19	30	31	62
Capital:					
Operating capital borrowed	$	6,954	8,147	8,350	10,134
MVP for operating capital	$	0.43	0.35	0.33	0.39
Long-term capital borrowed	$	2,891	2,082	1.677	0
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	0
Total hired labor used	hrs./yr.	0	0	0	0
MVP for cropland	$/acre	34.18	57.25	62.10	78.32
Income	$	7,767	8,800	9,174	9,756

Table 106. Optimum organization of the small dairy farm in the Fayette soil area (Farm II-4) at selected prices for milk, and hog price $18.60 per cwt.

		Milk price per cwt.		
	Unit	$0-3.51	$3.80	$4.20
Crop enterprises:				
Cont. corn	acres	25	47	47
CCOM	acres	66	0	0
COMM	acres	0	44	44
Livestock enterprises:				
Cows milked	cows	0	8	9
Milk sold	cwt.	0	784	967
Dairy system	-	-	stanchion	stanchion
Two-litter hog system	sows	25	22	21
One-litter hog system	sows	0	0	0
Beef cows	cows	7	0	0
Deferred fed calves	head	0	0	0
Medium yearlings	head	0	0	0
Facilities added for:				
Dairy	cows	0	0	0
Hogs	sows	11	8	7
Beef	A.U.	0	0	0
Feed:				
Corn harvested for grain	bu.	4,211	4,025	4,028
Corn harvested for silage	tons	0	23	23
Corn purchased	bu.	1,211	1,249	1,263
Corn sold	bu.	0	0	0
Hay baled	tons	19	29	30
Capital:				
Operating capital borrowed	$	7,158	8,324	8,514
MVP for operating capital	$	0.65	0.54	0.53
Long-term capital borrowed	$	2,999	2,185	1,776
MVP for family labor:				
Jan.-Feb.-Mar.	$/hr.	0	0	0
Apr.-May	$/hr.	0	0	0
Jun.-Jul.	$/hr.	0	0	0
Aug.	$/hr.	0	0	0
Sept.-Oct.	$/hr.	0	0	0
Nov.-Dec.	$/hr.	0	0	0
Total hired labor used	hrs/yr.	0	0	0
MVP for cropland	$/acre	36.10	65.47	70.79
Income	$	9,274	10,436	10,795

Table 107. Optimum organization of the large dairy farm in the Fayette soil area (Farm II-5) at selected prices for milk, and hog prices $11.10 and $12.60 per cwt.

		Milk price per cwt.			
	Unit	$0-2.46	$2.60	$3.00	$3.40
Crop enterprises:					
Cont. corn	acres	3	86	91	57
CCOM	acres	212	0	0	0
COMM	acres	0	129	124	158
Livestock enterprises:					
Cows milked	cows	0	10	11	21
Milk sold	cwt.	0	1062	1236	2289
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	0	0	0	0
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	3	0	0	0
Medium yearlings	head	210	187	182	133
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	0	0	0	0
Beef	A.U.	97	83	80	52
Feed:					
Corn harvested for grain	bu.	8,053	8,235	8,214	6,704
Corn harvested for silage	tons	0	52	101	52
Corn purchased	bu.	0	0	0	0
Corn sold	bu.	0	0	0	0
Hay baled	tons	159	193	181	194
Capital:					
Operating capital borrowed	$	32,491	32,867	32,899	28,891
MVP for operating capital	$	.78	.58	.11	.07
Long-term capital borrowed	$	8,869	7,521	8,289	4,716
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	0
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	0	0
Nov.-Dec.	$/hr.	0	0	0	1.29
Total hired labor used	hrs./yr.	0	0	0	17
MVP for cropland	$/acre	32.94	38.74	54.15	53.21
Income	$	12,664	12,836	13,261	14,126

Table 107 (Continued).

	Unit	Milk price per cwt. $3.80	$4.20
Crop enterprises:			
Cont. corn	acres	24	0
CCOM	acres	0	0
COMM	acres	191	215
Livestock enterprises:			
Cows milked	cows	41	52
Milk sold	cwt.	4519	5663
Dairy system	-	stanchion	parlor
Two-litter hog system	sows	0	0
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	42	0
Facilities added for:			
Dairy	cows	20	52
Hogs	sows	0	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	4,362	2,907
Corn harvested for silage	tons	163	202
Corn purchased	bu.	0	407
Corn sold	bu.	0	0
Hay baled	tons	163	157
Capital:			
Operating capital borrowed	$	23,082	20,932
MVP for operating capital	$	.07	.07
Long-term capital borrowed	$	13,070	22,292
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	1.29	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	0	0
Nov.-Dec.	$/hr.	1.29	0
Total hired labor used	hrs./yr.	108	0
MVP for cropland	$/acre	52.24	62.99
Income	$	15,606	17,809

Table 108. Optimum organization of the large dairy farm in the Fayette soil area (Farm II-5) at selected prices for milk, and hog price $14.10 per cwt.

		Milk price per cwt.			
	Unit	$0-2.61	$3.00	$3.40	$3.80
Crop enterprises:					
Cont. corn	acres	66	105	75	24
CCOM	acres	136	0	0	0
COMM	acres	13	110	140	191
Livestock enterprises:					
Cows milked	cows	0	8	21	41
Milk sold	cwt.	0	867	2289	4519
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	20	11	14	28
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	141	153	77	42
Facilities added for:					
Dairy	cows	0	0	0	20
Hogs	sows	0	0	0	0
Beef	A.U.	57	63	20	0
Feed:					
Corn harvested for grain	bu.	9,972	9,228	7,680	4,362
Corn harvested for silage	tons	0	52	52	163
Corn purchased	bu.	0	0	0	0
Corn sold	bu.	0	0	0	0
Hay baled	tons	121	156	143	163
Capital:					
Operating capital borrowed	$	25,645	29,028	23,048	23,082
MVP for operating capital	$	.36	.43	.07	.07
Long-term capital borrowed	$	5,163	5,751	1,823	13,070
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	1.29
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	0	0	.62	0
Nov.-Dec.	$/hr.	0	1.43	1.29	1.29
Total hired labor used	hrs./yr.	0	0	15	108
MVP for cropland	$/acre	40.31	40.24	51.68	53.18
Income	$	12,981	13,308	14,149	15,606

Table 108 (Continued).

	Unit	Milk price per cwt. $4.20
Crop enterprises:		
Cont. corn	acres	0
CCOM	acres	0
COMM	acres	215
Livestock enterprises:		
Cows milked	cows	52
Milk sold	cwt.	5663
Dairy system	-	parlor
Two-litter hog system	sows	0
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	52
Hogs	sows	0
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	2,907
Corn harvested for silage	tons	202
Corn purchased	bu.	407
Corn sold	bu.	0
Hay baled	tons	163
Capital:		
Operating capital borrowed	$	20,932
MVP for operating capital	$	.07
Long-term capital borrowed	$	22,292
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	0
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	0
Nov.-Dec.	$/hr.	0
Total hired labor used	hrs./yr.	0
MVP for cropland	$/acre	62.99
Income	$	17,809

Table 109. Optimum organization of the large dairy farm in the Fayette soil area (Farm II-5) at selected prices for milk, and hog price $15.60 per cwt.

		Milk price per cwt.			
	Unit	$0-2.52	$2.60	$3.00	$3.40
Crop enterprises:					
Cont. corn	acres	60	60	112	98
CCOM	acres	155	155	0	0
COMM	acres	0	0	103	117
Livestock enterprises:					
Cows milked	cows	0	5	12	21
Milk sold	cwt.	0	530	1322	2289
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	40	41	35	34
One-litter hog system	sows	0	0	0	0
Beef cows	cows	0	0	0	0
Deferred fed calves	head	20	0	0	0
Medium yearlings	head	37	48	42	7
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	18	19	13	12
Beef	A.U.	8	3	0	0
Feed:					
Corn harvested for grain	bu.	9,988	9,988	9,859	8,841
Corn harvested for silage	tons	0	0	0	52
Corn purchased	bu.	970	845	628	364
Corn sold	bu.	0	0	0	0
Hay baled	tons	50	69	91	80
Capital:					
Operating capital borrowed	$	16,540	18,158	19,044	16,543
MVP for operating capital	$	.22	.19	.07	.07
Long-term capital borrowed	$	5,643	5,482	3,761	3,214
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	0	.89
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	0	0
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	1.05	1.84	4.29	1.77
Nov.-Dec.	$/hr.	0	0	1.29	1.29
Total hired labor used	hrs./yr.	0	151	151	173
MVP for cropland	$/acre	34.35	36.18	41.92	51.49
Income	$	14,376	14,420	14,802	15,532

Table 109 (Continued).

	Unit	Milk price per cwt. $3.80	$4.20
Crop enterprises:			
Cont. corn	acres	96	0
CCOM	acres	0	0
COMM	acres	119	215
Livestock enterprises:			
Cows milked	cows	22	50
Milk sold	cwt.	2404	5458
Dairy system	-	stanchion	parlor
Two-litter hog system	sows	34	22
One-litter hog system	sows	0	0
Beef cows	cows	0	0
Deferred fed calves	head	0	0
Medium yearlings	head	0	0
Facilities added for:			
Dairy	cows	1	50
Hogs	sows	12	0
Beef	A.U.	0	0
Feed:			
Corn harvested for grain	bu.	8,750	2,821
Corn harvested for silage	tons	52	217
Corn purchased	bu.	264	3,359
Corn sold	bu.	0	0
Hay baled	tons	78	144
Capital:			
Operating capital borrowed	$	15,810	25,441
MVP for operating capital	$	.07	.22
Long-term capital borrowed	$	3,810	22,292
MVP for family labor:			
Jan.-Feb.-Mar.	$/hr.	.89	0
Apr.-May	$/hr.	0	0
Jun.-Jul.	$/hr.	0	0
Aug.	$/hr.	0	0
Sept.-Oct.	$/hr.	1.77	0
Nov.-Dec.	$/hr.	1.29	0
Total hired labor used	hrs./yr.	173	12
MVP for cropland	$/acre	51.49	63.05
Income	$	16,461	18,314

Table 110. Optimum organization of the large dairy farm in the Fayette soil area (Farm II-5) at selected prices for milk, and hog price $17.10 per cwt.

		Milk price per cwt.			
	Unit	$0-2.95	$3.00	$3.40	$3.80
Crop enterprises:					
Cont. corn	acres	60	25	83	83
CCOM	acres	155	190	2	2
COMM	acres	0	0	130	130
Livestock enterprises:					
Cows milked	cows	0	11	21	21
Milk sold	cwt.	0	1125	2289	2289
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	53	46	39	39
One-litter hog system	sows	0	5	0	0
Beef cows	cows	13	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	31	29	17	17
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	9,987	8,804	8,410	8,410
Corn harvested for silage	tons	0	0	0	0
Corn purchased	bu.	1,447	1,819	1,751	1,751
Corn sold	bu.	0	0	0	0
Hay baled	tons	32	53	91	91
Capital:					
Operating capital borrowed	$	14,204	15,761	17,981	17.981
MVP for operating capital	$	.42	.21	.13	.13
Long-term capital borrowed	$	8,733	7,009	4,841	4,841
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	1.37	1.37
Apr.-May	$/hr.	0	0	0	0
Jun.-Jul.	$/hr.	0	0	1.37	1.37
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	1.72	8.48	6.82	6.82
Nov.-Dec.	$/hr.	0	0	1.37	1.37
Total hired labor used	hrs./yr.	59	151	255	255
MVP for cropland	$/acre	32.82	37.93	36.25	36.25
Income	$	17,144	17,198	17,771	18,686

Table 110 (Continued).

	Unit	Milk price per cwt. $4.20
Crop enterprises:		
Cont. corn	acres	81
CCOM	acres	0
COMM	acres	134
Livestock enterprises:		
Cows milked	cows	24
Milk sold	cwt.	2653
Dairy system	-	stanchion
Two-litter hog system	sows	36
One-litter hog system	sows	0
Beef cows	cows	0
Deferred fed calves	head	0
Medium yearlings	head	0
Facilities added for:		
Dairy	cows	3
Hogs	sows	14
Beef	A.U.	0
Feed:		
Corn harvested for grain	bu.	7,947
Corn harvested for silage	tons	52
Corn purchased	bu.	1,795
Corn sold	bu	0
Hay baled	tons	88
Capital:		
Operating capital borrowed	$	18,848
MVP for operating capital	$	.19
Long-term capital borrowed	$	5,765
MVP for family labor:		
Jan.-Feb.-Mar.	$/hr.	1.44
Apr.-May	$/hr.	0
Jun.-Jul.	$/hr.	0
Aug.	$/hr.	0
Sept.-Oct.	$/hr.	3.95
Nov.-Dec.	$/hr.	1.44
Total hired labor used	hrs./yr.	290
MVP for cropland	$/acres	51.39
Income	$	19,621

Table 111. Optimum organization of the large dairy farm in the Fayette soil area (Farm II-5) at selected prices for milk, and hog price $18.60 per cwt.

		Milk price per cwt.			
	Unit	$0-3.17	$3.40	$3.80	$4.20
Crop enterprises:					
Cont.corn	acres	60	40	72	80
CCOM	acres	155	175	25	8
COMM	acres	0	0	118	127
Livestock enterprises:					
Cows milked	cows	0	9	18	21
Milk sold	cwt.	0	901	1848	2289
Dairy system	-	-	stanchion	stanchion	stanchion
Two-litter hog system	sows	54	44	43	40
One-litter hog system	sows	0	13	0	0
Beef cows	cows	12	0	0	0
Deferred fed calves	head	0	0	0	0
Medium yearlings	head	0	0	0	0
Facilities added for:					
Dairy	cows	0	0	0	0
Hogs	sows	0	10	24	22
Beef	A.U.	0	0	0	0
Feed:					
Corn harvested for grain	bu.	9,988	9,293	8,228	8,339
Corn harvested for silage	tons	0	0	0	0
Corn purchased	bu.	1,620	1,803	1,922	1,895
Corn sold	bu.	0	0	0	0
Hay baled	tons	31	43	88	91
Capital:					
Operating capital borrowed	$	14,637	16,069	17,830	18,310
MVP for operating capital	$	.64	.34	.30	.29
Long-term capital borrowed	$	8,942	9,687	5,929	4,957
MVP for family labor:					
Jan.-Feb.-Mar.	$/hr.	0	0	1.58	1.55
Apr.-May	$/hr.	0	1.62	0	0
Jun.-Jul.	$/hr.	0	0	0	1.55
Aug.	$/hr.	0	0	0	0
Sept.-Oct.	$/hr.	1.98	10.07	8.15	7.84
Nov.-Dec.	$/hr.	0	0	1.58	1.55
Total hired labor used	hrs/yr.	64	151	251	265
MVP for cropland	$/acre	34.60	38.27	44.15	41.34
Income	$	20,395	20,562	21,044	21,944